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INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE AND PINK SALMON FISHERIES
IN THE FRASER RIVER SYSTEM

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ANNUAL REPORT

1984

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C. WAYNE SHINNERS
MICHAEL W.C. FORREST
ROLLAND A. SCHMITTEN
TED A. SMITS
THOMAS E. KRUSE

NEW WESTMINSTER
CANADA
1985

INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

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AND PERIOD OF SERVICE
SINCE THE INCEPTION OF THE COMMISSION
IN 1937

CANADA

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Senator Thomas Reid	1937-1967
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	1968-1969
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Richard Nelson	1966-1976
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Milo Moore	1946-1949
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Albert M. Day	1947-1954
Alvin Anderson	1949-1950
Robert J. Schoettler	1951-1957
Elton B. Jones	1951-1957
Arnie J. Suomela	1954-1961
DeWitt Gilbert	1957-1974
George C. Starlund	1961-1966
Clarence F. Pautzke	1961-1969
Thor C. Tollefson	1966-1975
Charles H. Meacham	1969-1970
Donald R. Johnson	1971-1980
William G. Saletic	1974-1983
Donald W. Moos	1975-1977
Gordon Sandison	1977-1980
Herbert A. Larkins	1980-1983
Rolland A. Schmitten	1981-
Ted A. Smits	1983-
Thomas E. Kruse, Ph.D.	1984-

DIRECTOR OF INVESTIGATIONS

W. F. Thompson	1937-1942
B. M. Brennan	1943-1949
Loyd A. Royal	1951-1970
A. C. Cooper	1971-1981
John F. Roos	1982-

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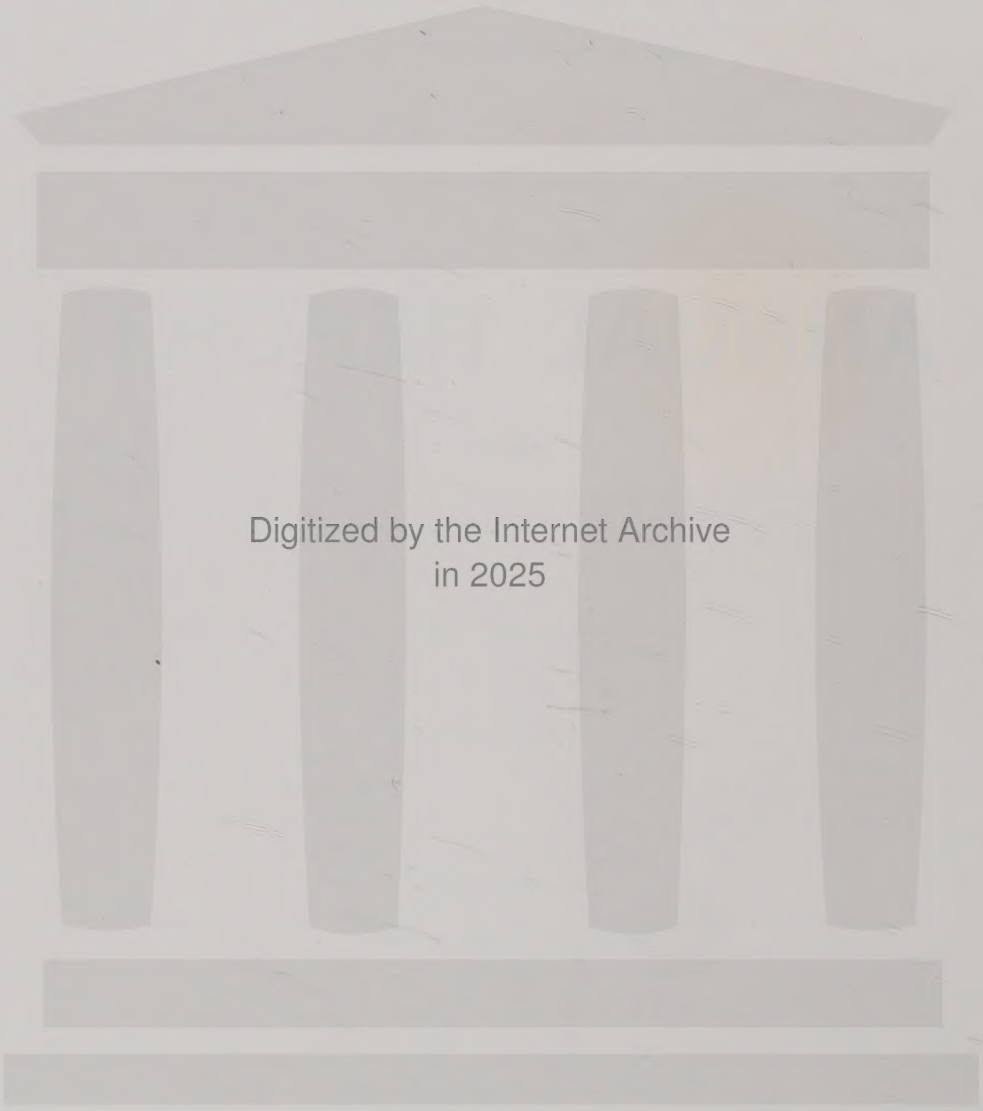
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A. J. (Joe) Whitmore

Mr. Whitmore was a member of the Commission from 1939-1966 and from 1968-1969. He died on October 9, 1984. With his extensive and responsible Canadian Government fisheries background, Mr. Whitmore applied himself diligently and effectively in establishing Commission policies and programs to restore Fraser River sockeye and pink salmon runs. He vigorously supported the Commission's objectives and authority under the Convention. He was held in high esteem by his fellow Commissioners and staff.

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REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1984

The 1984 return of Fraser River sockeye had been expected to be near the average for the cycle at 3,200,000 fish. The 1984 cycle year had always been the year of lowest abundance of Fraser River sockeye in the four-year cycle, since only one major stock (Chilko) is dominant on that cycle.

The actual total run in 1984 was an estimated 5,896,000 sockeye, the largest run on the cycle and even greater numbers than in 1983. The unexpected large return in 1984 (Figure 1) was particularly satisfying because of the historical low return on this cycle. The previous largest return on the cycle was 4,358,000 sockeye in 1976.

The exceptional return in 1984 followed the unusual oceanographic conditions caused by the "El Nino" event in 1983. Both the sockeye and pink salmon runs to the Fraser River in 1983 were below the predictions and while pink salmon were the smallest average weight on record, sockeye were also considerably below the long term average weight. The reduction in numbers of fish in 1983 could not be attributed directly to the "El Nino" phenomenon. However, the large return that occurred in 1984 was unexpected due to the seemingly unfavorable oceanographic conditions in 1983.

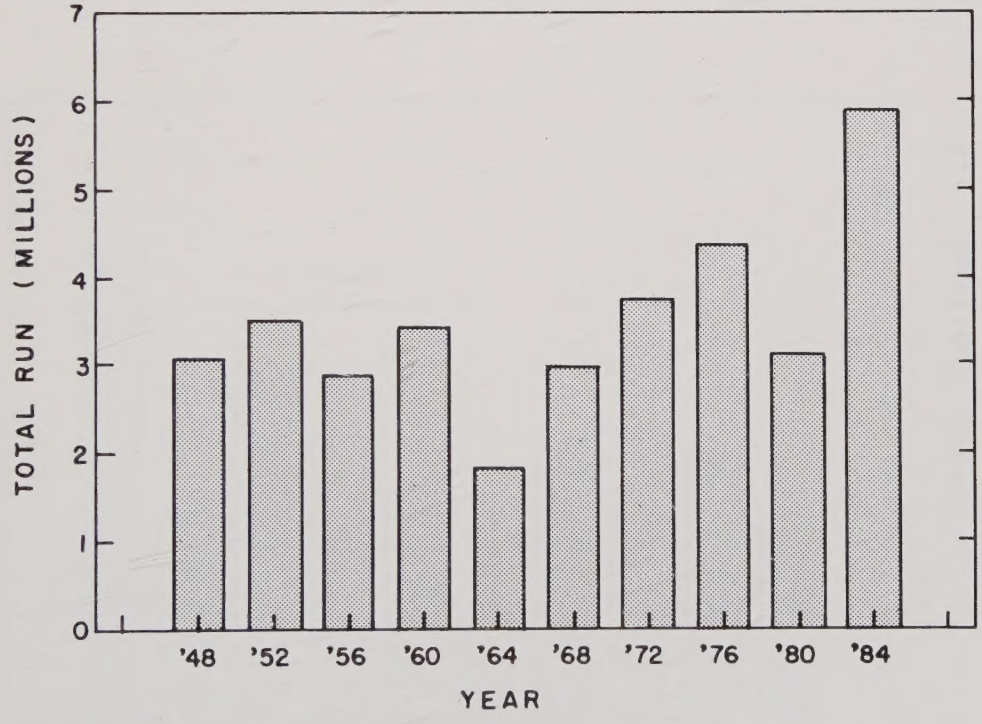

FIGURE 1. Fraser River sockeye total run — 1984 cycle (1948-1984).

The major contributor to the large total return in 1984 was the record Chilko sockeye return. The total return of 4,250,000 was about 1,800,000 fish more than the previous

largest run of 2,469,000 recorded in 1960. The marine survival from smolt to returning adult of almost 12% was unprecedented for populations in excess of 20 million. The previous highest marine survival for large smolt populations was 7.6%. The 1984 return was over 50% higher than in any previous year of comparable smolt output and survival of this magnitude was not predictable.

In addition to the record total run of all Fraser stocks on this cycle and the record Chilko run, the total commercial catch in Convention Waters of 3,216,000 sockeye was the largest since 1912 and was very likely the largest on record dating back to 1904, considering all fisheries. The total commercial catch of 4,579,000 Fraser sockeye in all fisheries (Figure 2) was the largest for all cycles and the 356,000 taken in the Fraser River Indian fishery, also formed the largest catch on the cycle.

In addition to record production and catches, the Commission expected that a minimum diversion rate through Johnstone Strait of 40% up to possibly 70%, would occur. However, the diversion rate was estimated at 31%. Thus, not only did the total run come back in unexpected numbers but more of the total run than expected migrated in a normal fashion.

The events of 1984 again illustrate the variable survival and behavior of Fraser River sockeye and the need for even greater understanding of these factors. The Commission believes the events of 1984 are reasons for future optimism in Fraser River sockeye production. However, there is continuing concern about the inconvenience and distress caused by errors in forecasting. Improved accuracy in forecasting is needed, not only for the fishing industry but also for fishery management.

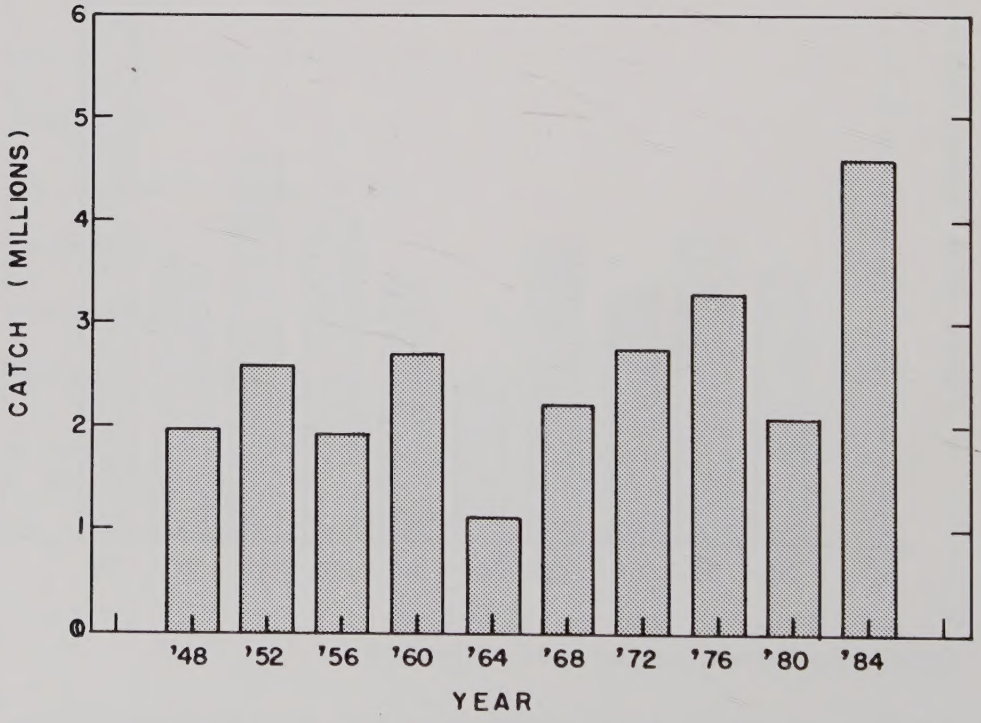

FIGURE 2. Fraser River sockeye commercial catach — 1984 cycle (1948-1984).

COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held fourteen formal and ten telephone conference meetings during 1984. The minutes of the meetings have been submitted to the Governments of Canada and the United States.

In January, Dr. Thomas E. Kruse was appointed as alternate Commissioner representing the United States. Commissioner Alvin W. Dixon was replaced by the Canadian Government in July; Mr. David C. Schutz was appointed in his place.

On June 1, the Commission approved the appointment of Mr. James Theodore to the Advisory Committee representing United States Salmon Processors. At the August 17 meeting, the Commission approved the reappointments of Mr. Nick Carr representing Canadian Purse Seine Crew Members and Mr. Earl Engman representing United States Sport Fishermen. The Commission also approved the appointment of Mr. Sam Douglas representing Canadian Native Indian Fishermen. On November 30, the Commission approved the appointments of Mr. Monte Davis representing United States Troll Fishermen and Mr. Vincent Barcott representing United States Purse Seine Fishermen.

The membership of the Advisory Committee for 1984 was as follows:

United States	*Canada*
W. Green (to November 29) Vincent Barcott (from November 30) Purse Seine Fishermen	J. Brajcich Purse Seine Fishermen
J. Lind (to May 31) J. Theodore (From June 1) Salmon Processors	B. Fraser Salmon Processors
R. Suggs Gill Net Fishermen	F. Nishii Gill Net Fishermen
T. Philpott Reef Net Fishermen	N. Carr Purse Seine Crew Members
C. Finley (to November 29) Monte Davis (from November 30) Troll Fishermen	B. Fahey Troll Fishermen
E. Engman Sport Fishermen	A. Downs Sport Fishermen
C. Peterson Native Indian Fishermen	S. Douglas (from August 17) Native Indian Fishermen

During 1984 Mr. R. A. Schmitten served as Chairman and Mr. M. W. Forrest served as Vice-Chairman and Secretary. The first meeting of 1984 was held February 3 when the Commission met with its Advisory Committee regarding tentative recommendations for regulatory control of the 1984 sockeye salmon fishery in Convention Waters. The tentative regulations had been submitted to the Committee on December 9, 1983. After certain revisions, the Commission approved the recommended regulations for submission to the two governments. The Advisory Committee approved the text of a resolution to the governments recommending retention of the Commission in its present format should a new Pacific Salmon Treaty be agreed to by the two countries.

On April 13 the Commission reaffirmed its approval for the budget request for the fiscal year 1984-1985. Commission responsibility for research on sockeye and pink salmon in Convention Waters was also discussed.

At its meeting on June 1 the Commission approved a revised budget for 1984-85 and the budget request for fiscal year 1985-1986. A draft of the 1983 Annual Report was approved and other administrative matters were discussed.

During the period July 20 through October 5 the Commission held nine formal and ten telephone conference meetings for adjustment of fishing regulations to achieve the desired escapement and as nearly as practicable, equitable division of the allowable catch of Fraser River sockeye. On August 24 the Commission and Advisory Committee inspected the Gates Creek spawning channel.

The Commission met November 30 to review the Annual Meeting presentation. The fourteenth and final formal meeting of the year was held on December 7 in Bellingham, Washington, when the Commission held its Annual Meeting with its Advisory Committee and approximately 350 representatives of industry, government and press.

1984 REGULATIONS

Recommendations for regulations governing the 1984 sockeye salmon fishery in Convention Waters were adopted at a meeting of the Commission held February 3, 1984 and were submitted to the two national governments for approval on February 24, 1984. On May 9, 1984, the United States Government informed the Commission that its recommended 1984 regulations were approved with the exception that certain Treaty Indians were excluded and would be regulated under separate regulations promulgated by the United States Department of the Interior. The National Marine Fisheries Service was designated to enforce Commission regulation in United States waters in cooperation with other United States agencies. The recommendations for Canadian Convention Waters were implemented during the fishing season under the Fisheries Act, Pacific Commercial Salmon Fishery Regulations.

The recommendations of the Commission were as follows:

Canadian Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Canadian Government that, in the interests of such fisheries, the following Fraser River Sockeye and Pink Salmon Fishery Regulations for Convention Waters for the season of 1984 be adopted and made effective by Public Notice under the Pacific Commercial Salmon Fishery Regulations, namely:

1. (1) No person shall fish for sockeye or pink salmon in Pacific Fishery Management Area 20-1, 3 and 4 with nets from the 24th day of June, 1984 to the 28th day of July, 1984, both dates inclusive.

(2) No person shall fish for sockeye or pink salmon with purse seines in the waters described in subsection (1) of this section from the 29th day of July, 1984 to the 18th day of August, 1984, both dates inclusive, except from half past six o'clock in the forenoon to half past six o'clock in the afternoon of Monday of each week.

(3) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section from the 29th day of July, 1984 to the 18th day of August, 1984, both dates inclusive, except from half past six o'clock in the afternoon of Sunday to half past six o'clock in the forenoon of Monday of each week.

(4) No person shall troll commercially for sockeye or pink salmon in the waters described in subsection (1) of this section from the 29th day of July, 1984 to the 18th day of August, 1984, both dates inclusive, except at times that net fishing may be permitted within that area.

(5) No person shall fish for sockeye or pink salmon in the waters described in subsection (1) of this section from the 19th day of August, 1984 to the 25th day of August, 1984, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon with nets in Pacific Fishery Management Areas 17 and 18 from the 24th day of June, 1984 to the 29th day of September, 1984, both dates inclusive.

(2) No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 18-1 from the 12th day of August, 1984 to the 29th day of September, 1984, both dates inclusive.

3. (1) No person shall fish for sockeye or pink salmon with purse seines in Pacific Fishery Management Area 29.

(2) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section.

(a) From the 24th day of June, 1984 to the 21st day of July, 1984; from the 26th day of August, 1984 to the 15th day of September, 1984; and from the 30th day of September, 1984 to the 6th day of October, 1984, all dates inclusive.

(b) From the 22nd day of July, 1984 to the 25th day of August, 1984, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week.

4. No person shall fish for sockeye or pink salmon with gill nets in Pacific Fishery Management Area 29-1 to 7 and 9 to 10 from the 16th day of September, 1984 to the 29th day of September, 1984, both dates inclusive, except from eight o'clock in the forenoon of Monday to eight o'clock in the forenoon of Tuesday of each week.

5. No person shall fish for sockeye or pink salmon in Pacific Fishery Management Area 29-11 to 17 from the 16th day of September, 1984 to the 29th day of September, 1984, both dates inclusive.

6. No person shall troll commercially for sockeye or pink salmon in Pacific Fishery Management Area 29-1 to 4, 6 to 7 and 9 to 10 from the 12th day of August, 1984 to the 29th day of September, 1984, both dates inclusive, except at times that net fishing may be permitted within that area.

7. Convention Waters westerly of the Bonilla Point-Tatoosh Island Lighthouse Line are excluded.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

United States Convention Waters

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries of the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the United States Government that regulations to the following effect, in the interests of such fisheries in Convention Waters, be adopted for the year 1984, and that an approved copy of said regulations be forwarded to the Director of Fisheries of the State of Washington for implementation by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

1. No person shall fish for sockeye or pink salmon with nets in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, 6, 6A, 6C, 7, 7A and 7D from the 24th day of June, 1984 to the 21st day of July, 1984, both dates inclusive.

2. (1) No person shall fish for sockeye or pink salmon with purse seines in Puget Sound Salmon Management and Catch Reporting Areas 4B, 5, 6, 6A, 6C, 7 and 7A:

(a) From the 22nd day of July, 1984 to the 18th day of August, 1984, both dates inclusive, except from five o'clock in the forenoon to half past nine o'clock in the afternoon of Monday of each week; and

(b) From the 19th day of August, 1984 to the 25th day of August, 1984, both dates inclusive, except from five o'clock in the forenoon to nine o'clock in the afternoon of Monday.

(2) No person shall fish for sockeye or pink salmon with gill nets in the waters described in subsection (1) of this section:

(a) From the 22nd day of July, 1984 to the 28th day of July, 1984, and from the 5th day of August, 1984 to the 11th day of August, 1984, all dates inclusive, except from seven o'clock in the afternoon of Monday to half past nine o'clock in the forenoon of Tuesday of each week; and

(b) From the 29th day of July, 1984 to the 4th day of August, 1984, and from the 12th day of August, 1984 to the 18th day of August, 1984, all dates inclusive, except from seven o'clock in the afternoon of Sunday to half past nine o'clock in the forenoon of Monday of each week; and

(c) From the 19th day of August, 1984 to the 25th day of August, 1984, both dates inclusive, except from six o'clock in the afternoon of Monday to nine o'clock in the forenoon of Tuesday.

(3) No person shall fish for sockeye or pink salmon with reef nets in the waters described in subsection (1) of this section:

(a) From the 22nd day of July, 1984 to the 28th day of July, 1984, and from the 5th day of August, 1984 to the 11th day of August, 1984, all dates inclusive, except from six o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday of each week; and

(b) From the 29th day of July, 1984 to the 4th day of August, 1984, and from the 12th day of August, 1984 to the 18th day of August, 1984, all dates inclusive, except from half past nine o'clock in the forenoon to half past nine o'clock in the afternoon of Sunday of each week; and

(c) From the 19th day of August, 1984 to the 25th day of August, 1984, both dates inclusive, except from six o'clock in the forenoon to nine o'clock in the afternoon of Sunday.

3. No person shall fish for sockeye or pink salmon with nets in Puget Sound Salmon Management and Catch Reporting Areas 6, 6A, 7 and 7A from the 26th day of August, 1984 to the 8th day of September, 1984, both dates inclusive.

4. No person shall fish for sockeye or pink salmon with nets in Puget Sound Salmon Management and Catch Reporting Area 7B, except for those sockeye or pink salmon taken in nets having mesh of not less than 7 inches as authorized for the taking of chinook salmon by the Director of Fisheries of the State of Washington, from the 24th day of June, 1984 to the 18th day of August, 1984, both dates inclusive.

5. No person shall fish for sockeye or pink salmon with nets in that portion of the waters described in section 3 lying westerly of a straight line drawn from the low water range marker in Boundary Bay on the International Boundary through the east tip of Point Roberts in the State of Washington to the East Point Light on Saturna Island in the Province of British Columbia from the 9th day of September, 1984 to the 29th day of September, 1984, both dates inclusive.

6. The following Convention Waters are excluded:

(1) High Seas westerly of the Bonilla Point-Tatoosh Island Lighthouse Line.

(2) Puget Sound Salmon Management and Catch Reporting Areas 6B, 6D and 7C.

(3) Preserves previously established by the Director of Fisheries of the State of Washington for the protection of other species of food fish.

All times hereinbefore mentioned shall be Pacific Daylight Saving Time."

Emergency Orders

To provide for adequate escapement of the various races of Fraser River sockeye salmon and for equitable shares of the catch by fishermen of the United States and Canada, the approved regulations were adjusted by the Commission as follows:

August 3, 1984 — For division of catch, the Commission approved United States Convention Waters open as scheduled but for 2 days for the week commencing August 5.

August 7, 1984 — For division of catch and greater harvest of Chilko River sockeye, the Commission approved a 1 day extension of fishing in United States Convention Waters, making a total of 3 days of fishing for the week.

August 10, 1984 — For harvest of Chilko River sockeye the Commission approved the following regulatory changes: 1) That United States Convention Waters reopen August 11 for 3 days; 2) That Area 20-1, 3 and 4 of Canadian Convention Waters opening be advanced 24 hours for 2 days; 3) That Area 29 of Canadian Convention Waters reopen August 11 for 2 days.

August 13, 1984 — For harvest of Chilko River sockeye, the Commission approved the following regulatory changes: 1) That fishing in Area 20-1, 3 and 4 of Canadian Convention Waters be extended 1 day for a total of 3 days in the current period; 2) That fishing in United States Convention Waters be extended 1 day for a total of 4 days in the current period; 3) That Area 29 of Canadian Convention Waters open August 15 for 2 days.

August 17, 1984 — For division of catch the Commission approved the following regulatory changes: 1) That United States Convention Waters not open as scheduled for the week commencing August 19; 2) That Area 20-1, 3 and 4 of Canadian Convention Waters opening be advanced 24 hours for 2 days; 3) That the opening of Area 29 of Canadian Convention Waters be delayed 24 hours for 1 day.

August 20, 1984 — For harvest and division of catch, the Commission approved the following regulatory changes: 1) That fishing in Area 20-1, 3 and 4 of Canadian Convention Waters be extended for 2 additional days; 2) That United States Convention Waters, scheduled to open on August 20, be delayed 48 hours until August 22 and open for 1 day.

August 22, 1984 — For harvesting of Chilko River sockeye and division of catch, the Commission approved the following regulatory changes: 1) That fishing in Area 20-1, 3 and 4 of Canadian Convention Waters be extended 1 day making a total of 5 days for the current week; 2) That Area 29 of Canadian Convention Waters reopen August 24 for 1 day; 3) That the opening of United States Convention Waters be extended 24 hours for a total of 2 days of fishing for the current week.

August 24, 1984 — For additional harvest of Chilko River sockeye and division of catch, the Commission approved the following regulatory changes: 1) That regulatory control of Area 20 of Canadian Convention Waters be retained beyond August 25; 2) That Area 20-3 and 4 of Canadian Convention Waters open August 26 for 2 days; 3) That United States Convention Waters open August 27 for 1 day; 4) That Area 29 of Canadian Convention Waters open August 27 for 1 day.

August 28, 1984 — Due to declining numbers of sockeye, the Commission approved relinquishing regulatory control of Area 20 of Canadian Convention Waters effective 12:01 a.m., August 29.

August 31, 1984 — For harvesting of Weaver Creek sockeye and division of catch, the Commission approved the following regulatory changes: 1) That Area 29-1 to 5 of Canadian Convention Waters open to gill nets September 4 for 2 days; 2) That Area 29-1 to 4 of Canadian Convention Waters open to trolling September 4 for 2 days; 3) That Area 29-1 to 4 and 6 of Canadian Convention Waters open to trolling September 6 for 2 days.

September 1, 1984 — To avoid conflicting with the Canadian federal election, the Commission approved delaying by 24 hours the previously scheduled openings in Area 29 of Canadian Convention Waters for the week commencing September 2.

September 7, 1984 — To harvest Weaver Creek sockeye, the Commission approved the following regulatory changes: 1) That Area 29-1 to 5 of Canadian Convention Waters open to gill nets September 10 for 1 day; 2) That Area 29-1 to 4 of Canadian Convention Waters open for trolling September 10 for 1 day; 3) That Area 29-1 to 4 and 6 of Canadian Convention Waters open for trolling September 11 for 2 days.

September 14, 1984 — For protection of Birkenhead River sockeye and the harvest of Weaver Creek sockeye, the Commission opened Area 29-1 to 4, 6, 7, 9 and 10 of Canadian Convention Waters for trolling September 19 for 12 hours, and Area 29-1 to 7, 9 and 10 of Canadian Convention Waters for gill nets September 19 for 12 hours.

September 20, 1984 — The Commission approved that Area 29 of Canadian Convention Waters would not open as scheduled for the week commencing September 23.

September 25, 1984 — For harvesting of Weaver Creek sockeye, the Commission opened Area 29-1 to 4 of Canadian Convention Waters for trolling September 26 for 12 hours, and Area 29-1 to 5 of Canadian Convention Waters to gill nets September 26 for 12 hours.

October 5, 1984 — The Commission extended the regulatory control of Area 29 of Canadian Convention Waters to October 14 and kept the area closed to fishing.

The Commission relinquished regulatory control of the remaining Convention Waters effective October 14, thus completing the Commission's regulatory obligations for Convention Waters for the 1984 season.

SOCKEYE SALMON REPORT

The Fishery

A cycle year record of 5,896,000 Fraser River sockeye returned in 1984. The actual run was 84% larger than the forecast of 3,200,000 fish. It provided a total commercial catch in all areas of 4,588,000 sockeye — exceeding all previous catches on the cycle, even those in pre-1913 years. The 1912 catch of 3,363,000 Fraser River sockeye and the 1976 catch of 3,284,000 fish were the largest previous commercial harvests. Of the total

run, 4,501,000 Fraser sockeye entered Convention Waters. Commercial fishermen caught 3,213,000 (71.4%); Fraser River Indian fishermen landed 356,000 (7.9%); and 932,000 (20.7%) escaped to the Fraser River spawning grounds (see Tables I to VI in Appendix). Canadian non-Convention area fisheries in Johnstone Strait landed 1,248,000 Fraser River sockeye and coastal areas north of Convention Waters produced additional landings of 127,000 Fraser sockeye. An estimated 20,000 Fraser sockeye were taken in Johnstone Strait non-commercial, Indian fisheries.

Within the Convention area, fishermen in Canada landed 1,576,000 sockeye (49.0%) and the United States harvest was 1,640,000 sockeye (51.0%). The total commercial harvest in Convention Waters of 3,216,000 sockeye, including 3,000 non-Fraser fish, was the largest catch for this area on the cycle since 1912. The United States catch was also the largest on the cycle since 1912. In the United States, purse seines caught 675,000 sockeye or 41.2% of the total United States catch (Appendix Table I). This was the largest catch for purse seines on the cycle since 1960, but the percentage catch was the second lowest on record, slightly ahead of the 1980 percentage. Gill nets harvested 934,000 (57.0%) sockeye in 1984, the largest catch on the cycle for this gear. The percentage catch for gill nets was the highest of any year of record. Reef nets landed 31,000 sockeye, an increase over the previous two cycles but a decline to 1.9% of the United States total.

Purse seines in Canada accounted for 424,000 sockeye, 26.9% of the catch. The catch was the second largest on the cycle while the percentage catch was third highest. Canadian gill net fishermen harvested 1,038,000 sockeye, the largest catch by this gear on the cycle since 1936. The gill net percentage catch (65.9%) was, however, the second lowest on record for the cycle. Troll catches reached 114,000 sockeye, 7.2% of Canada's total. Both the catch and percentage catch were the highest recorded on the cycle. The total Canadian catch of 1,576,000 sockeye was the largest on the cycle since 1936.

The Canadian Convention area catch was taken primarily easterly of William Head in Area 29 (Table 1). The easterly area contributed 63% of the Canadian catch and totaled 992,000 sockeye, which was a significantly larger catch than in recent cycle years. Catches westerly of William Head, primarily in Area 20, totaled 584,000 sockeye or 37% of the Canadian catch.

TABLE 1. 1984 Canadian sockeye catch by gear and area.

		Number	Percent
Area 30-1 to 3	Troll	17,497	1.11
Area 20	Purse Seine	423,600	26.88
	Gill Net	143,041	9.08
Westerly Area Total		584,138	37.07
Areas 17 & 18	Troll	36,821	2.34
Area 29	Gill Net	895,282	56.81
	Troll	59,592	3.78
Easterly Area Total		991,695	62.93
Grand Total		1,575,833	100.00

Ocean temperatures in the spring of 1984 were above the long-term average, as has been the case for the past 7 years. This led to forecasts of later-than-normal onshore migration timing and well-above-average diversion through Johnstone Strait. While the forecast of timing proved correct, the diversion of sockeye via Johnstone Strait, estimated

post-seasonally at 31% of the run, was substantially lower than forecast, but above the 24% average for the period 1953-1983. The lower-than-expected diversion resulted in 76.7% of the total stock reaching Convention Waters. The commercial catch of 1,375,000 sockeye in non-Convention Waters, primarily in Johnstone Strait, was the largest on the cycle (Table 2). These catches represented 30.0% of the commercial harvest as compared with 55.8% taken in 1980, the brood year, when 70% of the run approached the Fraser River via Johnstone Strait.

TABLE 2. Fraser sockeye catches on the 1984 cycle.

Year	Convention	Non-Convention	Total	% Non-Convention
1956	1,801,000	128,000	1,929,000	6.64
1960	2,454,000	235,000	2,689,000	8.74
1964	1,016,000	104,000	1,120,000	9.29
1968	1,798,000	407,000	2,205,000	18.46
1972	2,197,000	546,000	2,743,000	19.91
1976	2,684,000	600,000	3,284,000	18.27
1980	915,000	1,154,000	2,069,000	55.78
1984	3,213,000	1,375,000	4,588,000	29.97

Since the return was larger than expected, fishing times greater than in recent cycle years, were provided in United States waters and in Area 20 of Canadian Convention Waters (Table 3). Fishing time in Area 29 of Canadian waters was reduced in September due to concerns of the Canadian Government for other species. In addition to the 12 days of fishing in the United States under Commission regulations, the United States Government granted 14 extra fishing periods for Treaty Indian fishermen in Puget Sound and 17 extra fishing periods in the outer Juan de Fuca Strait areas. Catches by Treaty Indians during those extra fishing periods totaled 396,000 sockeye.

TABLE 3. Number of fishing days allowed for sockeye salmon harvest.

	1976	1980	1984
UNITED STATES:	9	8*	12*
CANADA:			
Area 20	10	4	12
Area 29	17	17	15

* Commission regulations

The highlight of the 1984 run was the return of 4,250,000 Chilko River and Chilko Lake sockeye. The 1984 Chilko run was approximately 72% larger than the previous maximum run of 2,469,000 in 1960 (Figure 3). Almost all (98.6%) of the returnees were 4-year-old fish from the 1980 brood year escapement of 499,000 spawners. That spawning produced a record outmigration of 35,000,000 smolts in the spring of 1982. Whereas previous experience indicated a reduced marine survival for such a large smolt migration (Figure 4), 11.9% of the 1982 smolts survived to return as adults. This was the highest recorded marine survival for the cycle — and for all years with similar smolt numbers. Three-year-old jack sockeye returns in 1983 were very low and did not provide an accurate indication of the adult run which followed in 1984. Environmental variables normally included in developing forecasts, particularly the Fraser River discharge, had indicated that above average survival might be expected, but none predicted the resultant survival of 11.9%.

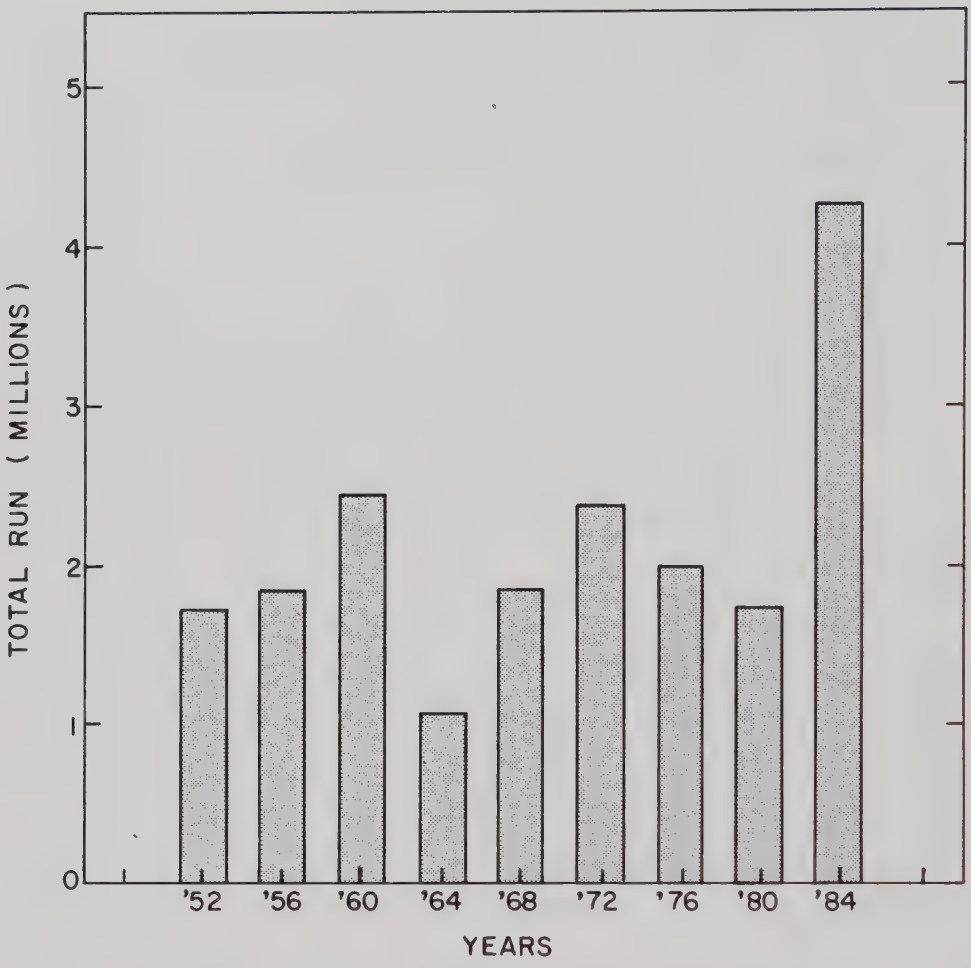

FIGURE 3. Total Chilko area sockeye production on the dominant cycle, 1952-1984.

Whereas Chilko sockeye accounted for 72.5% of the 1984 total run, these stocks provided 74.3% of the catch because attempts were made to concentrate harvests on the very large return, but ensuring escapement of good numbers to the spawning grounds. The commercial harvest of 3,400,000 Chilko sockeye exceeded the previous largest Chilko catch by nearly 1,430,000 fish.

Other stocks in the 1984 return were Weaver Creek (385,000 sockeye), Birkenhead River (380,000) and Stellako River (320,000). With the Chilko stocks, these runs comprised 92% of the 1984 return. The good returns of both Weaver Creek and Birkenhead River sockeye were harvested at high rates concurrent with Chilko sockeye. The total commercial catch of 320,000 Weaver sockeye — 83% of the total Weaver Creek return — was the second largest catch on record. Nearly 65% of Birkenhead sockeye and 36% of the Stellako return were 5-year-old fish from the 1979 spawning. These two stocks comprised 360,000 of the total of 525,000 5-year-old sockeye that returned to the Fraser watershed in 1984. The run of 5-year-old fish in 1984 was the largest return of this age group on the cycle. Gates Creek sockeye provided a return of 79,000 fish, primarily from the spawning channel. This dominant cycle return was near the long-term average stock size.

Fish size in 1984 was generally small, similar to several recent returns. Average weight of 4-year-old adults was 5.5 pounds or approximately 0.4 pounds smaller than the cycle year mean. Average weights of landings were not as low due to the relatively high proportion of 5-year-old fish in the catch.

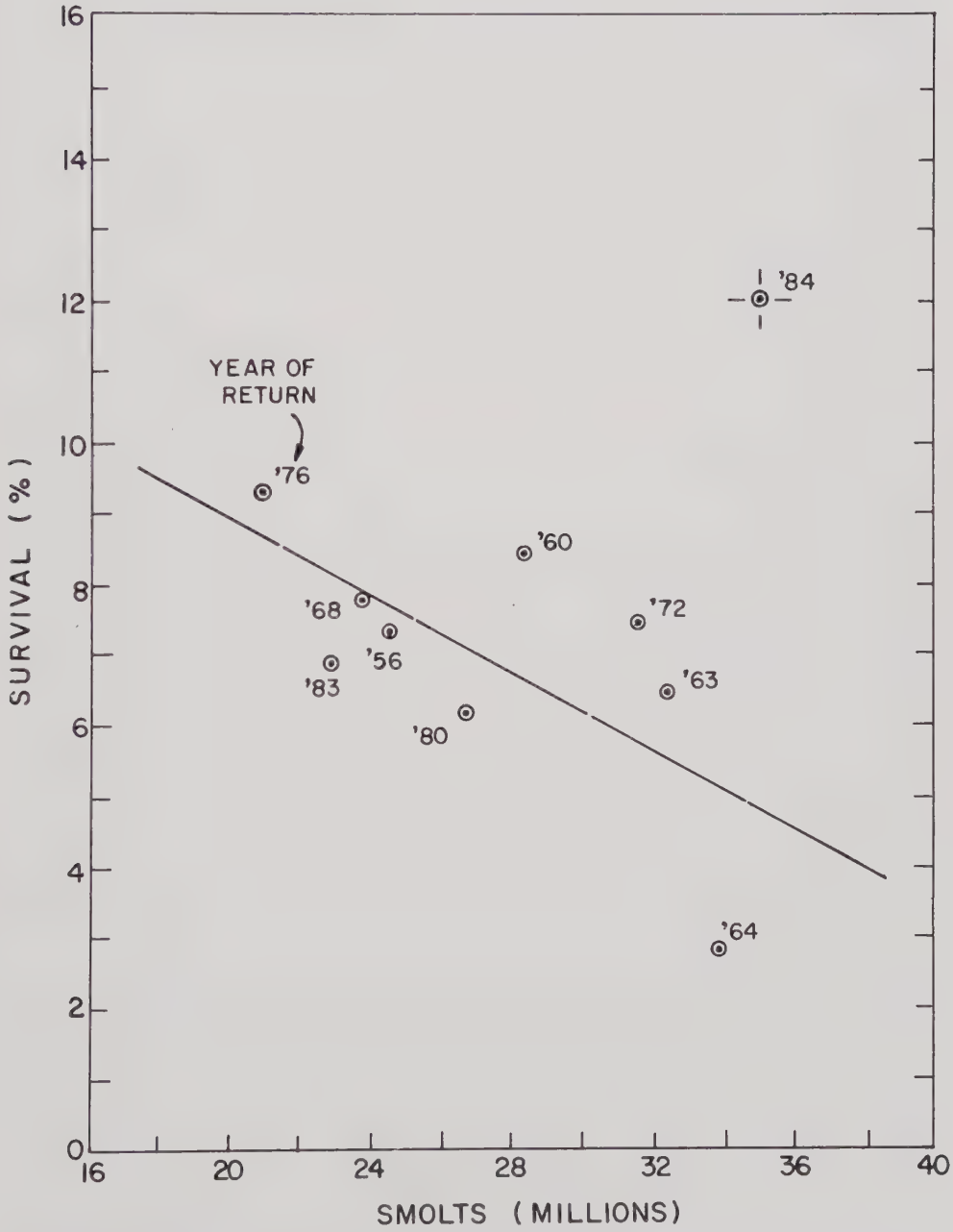

FIGURE 4. Relationship between Chilko River sockeye smolt abundance and survival in years with over 20,000,000 smolts.

Escapement

The 1984 escapement of 932,000 sockeye (Appendix Table VI) was the largest recorded on the cycle since 1948. However, the escapement represented only 15.9% of the total return, the lowest percentage escapement for the cycle and the third lowest percentage escapement on all cycles in the past 40 years. The large run was heavily fished since escapement goals had been based on the optimum escapement of the stocks for the cycle. The escapement of most individual stocks reached preseason goals; however, certain stocks that were in the fishing areas with Chilko sockeye were harvested at the same high rate and, hence, escaped at levels that were lower than desired.

Early Stuart sockeye escapement on the cycle had been severely reduced by high Fraser River discharges during upstream migration in the 1960's and 1970's. The forecast of low total return in 1984 led the Commission to impose closures on the Convention area commercial fishery and to request that the Canadian Government restrict the Johnstone Strait and the Fraser River Indian fisheries. Implementation of these restrictions, cooperation of commercial and Fraser River Indian fishermen, strict enforcement of regulations, and favorable migration conditions resulted in nearly 80% of the run arriving at the spawning grounds. The total escapement was 45,000 spawners, over 2.6 times the brood year escapement of 17,000 fish. The majority of these fish spawned successfully in Middle River tributary streams, the traditional spawning areas of the run on the 1984 cycle.

Several other early sockeye stocks reached the upper Fraser watershed spawning areas in good numbers. Both of the Nadina River runs showed improvement. The early run increased four-fold to 800 spawners while the late run more than doubled from 3,100 in 1980 to 7,100 spawners, of which 6,400 entered the spawning channel. Bowron River sockeye increased to 10,500 fish from an escapement of 2,900 in 1980. Nearly 23% of Bowron sockeye were 5-year-old fish from the 1979 brood year.

The escapement of mid-season sockeye to the Nechako watershed did not increase in 1984 due to harvest rates that were higher than on the early stocks. The Late Stuart escapement was up slightly to 1,200 spawners from 1,000 in 1980 while Stellako River sockeye decreased from 72,000 spawners in the brood year to 61,000 in 1984. The Stellako escapement was, however, near the historical optimum for the cycle. Nearly 36% of the Stellako spawners were 5-year-old fish produced by the large 1979 spawning. A portion of the reduced return in 1983 of that brood (reported in the Commission's 1983 Annual Report) can be attributed to delayed maturation.

The escapement to Horsefly River and other Quesnel Lake tributaries was estimated to be 6,200 fish. Approximately 85% of these fish were 3-year-old male "jack" sockeye, preceding the main return of 4-year-old fish in 1985.

Sockeye returning to the Chilko watershed spawn both in the lake and in the upper portion of Chilko River. The major population has always been the Chilko River stock. In 1984, this segment of the population had a total escapement of 453,000 spawners, 3% lower than in 1980. The lake spawners increased in abundance from 30,000 escapement in 1980 to 128,000 in 1984. The very large escapement was due, in part, to reduced fishing effort on this early migrating stock, while the later running Chilko River fish experienced higher fishery removals. The lake spawning population was double the previous maximum recorded escapement.

A severe storm in early October caused flooding in the lake's tributaries and extreme turbidity and debris in Chilko Lake. Although the major spawning was completed, concern exists that deposition of silt and debris on lake beaches may have reduced the egg-to-fry survival of this group of sockeye.

In the Seton-Anderson system, Gates Creek and Portage Creek sockeye fry reside together in Seton Lake. The escapements to these streams have substantial cyclic variation. The 1984 return was the dominant cycle year run for Gates Creek but was a low cycle year for Portage Creek sockeye. An escapement of 29,000 spawners was recorded at Gates Creek with 26,400 of these fish entering the spawning channel. This return and distribution represented small increases over the brood year but did establish new records for escapement. Unfortunately, prespawning mortalities reduced the effective female population by 41%. Portage Creek sockeye spawners declined 12% to 1,800 fish in 1984.

Escapements of early-timed stocks migrating to Thompson River tributary streams showed substantial increases. Strong returns and reduced fishing pressure resulted in several escapement numbers reaching record levels. The most significant of these was a six-fold increase in escapement to the Upper Adams River. A total of 3,500 spawners returned, likely the largest spawning population since 1917. Sockeye spawning in Momich River and in Cayenne Creek above Momich Lake have developed into a sizable run since presence of this population was first observed in 1960. In 1984, the escapement to this stream reached 5,900 spawners, the largest on record and an increase of 75% from the brood year.

Even though the Seymour River run in 1984 was an off-cycle return, it had a total escapement of 17,200 spawners, up from 8,400 in 1980. The late run to Lower Adams River in 1984 was an off-cycle return, as well. The escapement was estimated to be 4,200 spawners, nearly double the brood year level and close to the long-term average escapement for the cycle-year. Only small numbers of late-run fish returned to other Shuswap Lake tributaries on this cycle.

Two North Thompson River tributaries had good sockeye escapements in 1984. Raft River spawning escapements reversed a slow decline observed since 1972 with the arrival of 19,100 fish. This was nearly four times the number present in the brood year and was the largest escapement to this stream in 41 years. The second North Thompson stock spawns in Fennell Creek, a tributary of North Barriere Lake. The escapement of 11,000 spawners in 1984 was an increase from 8,400 in the brood year and appears to be near the optimum for this limited spawning area.

The escapements of lower watershed stocks were at or below brood year levels. The return to Birkenhead River was particularly affected. A total of 42,800 spawners escaped compared with 91,000 in 1980. The escapement was the lowest on the cycle since 1960. Severe flooding of the Birkenhead River in December, 1980, reduced fry production and resulted in a low return of 4-year-old fish. In 1984, nearly 65% of the adult spawners were 5-year-olds from the 1979 spawning. Extreme flooding in early October, 1984, disrupted spawning and will undoubtedly reduce production on this cycle even further.

Weaver Creek sockeye returned in good abundance with 60,000 fish arriving at the spawning grounds. While this total was a reduction from 75,000 spawners in the brood year, the total was sufficient to allow the second highest number of fish (46,000) to enter the spawning channel in 20 years of operation.

Two late-run sockeye stocks, Harrison River and Cultus Lake, returned at levels below the brood year. Harrison River escapement of 1,300 fish was the lowest recorded since 1944. Similarly, the Cultus Lake escapement of 1,100 spawners was the lowest recorded for the cycle.

Early-run sockeye to Pitt River was estimated at 15,800 spawners, down from 17,000 in the brood year. While natural reproduction likely suffered from October floods in 1984 on this stream as well, eggs secured for the incubation channel will mediate these losses.

The total escapement of 922,000 adult spawners was 10% larger than the preseason goal of 845,000 fish. Even though the escapement was larger than the goal, most of the increase spawned in areas that have the capacity for increased spawning and rearing. The preseason escapement expectations were exceeded on Nadina, Bowron, Chilko Lake, Gates, Momich, Raft and Seymour stocks. With respect to the more significant stocks, spawner shortfalls were recorded only for Upper Pitt and Birkenhead. Escapements to the spawning channels at Weaver Creek, Gates Creek and Nadina River increased over the brood year. Success of spawning was good except at Gates Creek and Raft River. In total, 95% of all females spawned successfully. Flooding in the fall of 1984 during early incubation is expected to reduce survival from egg-to-fry in unstable coastal streams.

SPAWNING CHANNEL OPERATIONS

Estimates of production of sockeye and pink salmon fry from Commission operated spawning channels are presented in Table 4. In total, 56,720,000 sockeye and 18,169,000 pink salmon fry emerged in spring, 1984 from the 1983 spawning.

TABLE 4. Sockeye and pink salmon fry production from the 1983 brood at spawning and incubation channels.

Site	Species	Eggs Deposited	Fry Produced	Survival
Upper Pitt	Sockeye	4,789,000*	3,738,000	78.1
Weaver Creek	Sockeye	51,182,000	29,308,000	57.3
Gates Creek	Sockeye	9,427,000	5,622,000	59.6
Nadina River	Sockeye	43,601,000	18,052,000	41.4
Upper Seton	Pink	9,405,000	2,594,000	27.6
Lower Seton	Pink	31,060,000	15,575,000	50.1

* eggs taken

The incubation channel at Upper Pitt River produced 3,738,000 fry which was close to the 10-year average output. Survival was also near normal at 78.1% of the eggs taken.

A modest escapement of 19,200 sockeye in Weaver channel had deposited 51,182,000 eggs in 1983. The actual emergence was 29,308,000 fry or 57.3% of the eggs deposited. The fry output was 10% higher than in the brood year.

At Gates Creek, an excellent non-dominant year escapement of 7,500 sockeye deposited 9,427,000 eggs. The 1984 emergence totaled 5,622,000 fry, the largest production in 12 off-cycle years during the 16 years of channel operation. Survival at 59.6% was near the long-term average for the density of female spawners in the channel. Late Nadina sockeye utilize the spawning channel located on the uppermost portion of the Nadina River. The 1983 female population deposited 43,601,000 eggs, the largest number since construction of the channel in 1973. Survival to emergence was 41.4% and 18,052,000 fry emerged in 1984. The output of fry was the second largest in the 11 years of operation while the survival was slightly below the expected level given the density of females in the channel.

Egg deposition in the Seton Creek pink salmon spawning channels in 1983 was 9,405,000 in the upper channel and 31,060,000 eggs in the lower channel. The lower channel yielded 15,575,000 fry for a 50.1% egg-to-fry survival and the upper channel produced 2,594,000 fry for a survival of 27.6%. Both survival percentages are the second lowest on record for the respective channels, however, the number of fry produced was

near normal for the lower channel. Fry output in the upper channel was only 58% of the average (4,493,000) for 11 previous cycle years of operation.

Sockeye returns attributable to spawning channels in 1984 resulted from the 1979, 1980 and 1981 brood year escapements. Total production from the four facilities was estimated to be 500,000 sockeye. This was 8.5% of the total Fraser sockeye run in 1984. Production of sockeye from the spawning channels provided a commercial catch estimated at 384,000 fish. The total production and catch were the second largest on record, exceeded only in 1982. Since 1977, the first year all four sockeye channels had adult returns, a total of 3,664,000 sockeye has been produced by spawning channels which amounts to 3.6% of the total runs of Fraser sockeye in that period.

Returns in 1985 attributable to Pitt River incubation channel totaled 19,000 fish. One half of these were 4-year-old fish of the 1980 brood; the other half were 5-year-old fish from the 1979 spawning. Severe flooding on December 26-27, 1980 reduced natural survival estimates to such a low level that the channel output of 3.9 million accounted for 79.3% of the total fry from that year's escapement. The stabilization of fry output in years of poor natural production has been a great benefit to the natural production since many adults produced in the channel return to spawn in the river.

An excellent return of 385,000 Weaver sockeye was attributable to the spawning channel (Figure 5). The return was the second largest to the channel in 16 years of adult production. Approximately 323,000 of these fish were caught in the commercial fishery with a landed value of 3.1 million dollars to fishermen.

Total 1984 production of sockeye from the Gates Creek spawning channel was estimated at 74,500 fish, nearly all 4-year-olds from the dominant cycle 1980 brood spawning. The total was the second largest since Gates channel returns commenced in 1972. Commercial fishermen landed 39,100 of these fish.

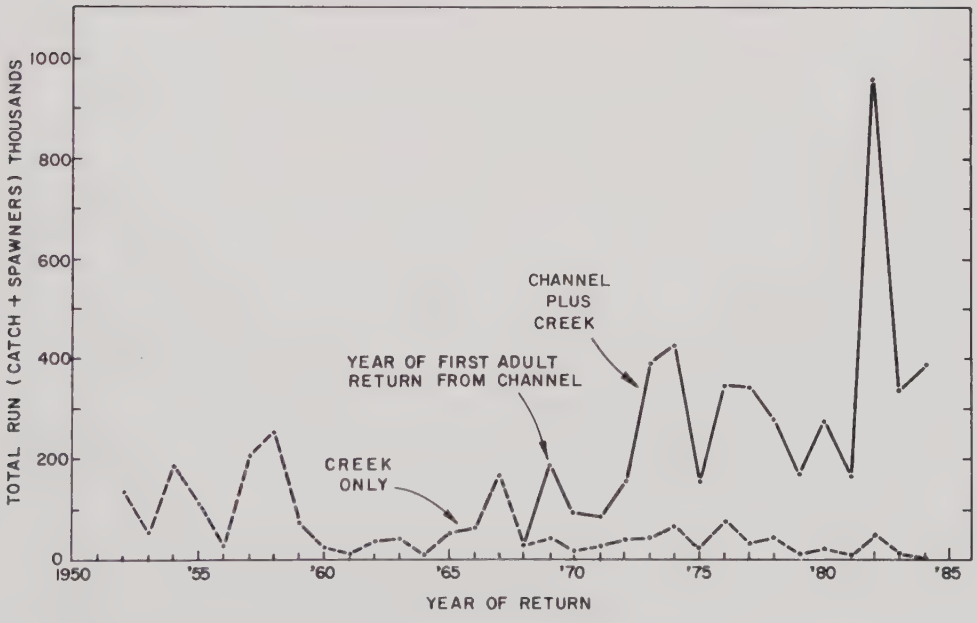

FIGURE 5. Sockeye production from Weaver Creek and Weaver channel, 1952-1984.

1984 was an off-cycle year for sockeye from the Nadina River spawning channel. An estimated 21,700 adult sockeye returned, of which 13,300 were 4-year-old fish and 8,400 were 5-year-old adults. The return of 4-year-olds, while small, represented a survival of 0.67% from fry to adult, somewhat above the average off-cycle rate of survival for Nadina channel fry in recent years.

Overall, escapements to spawning channels operated by the Commission were excellent in 1984. A nearly full complement of 4.371 million eggs was secured from Pitt River sockeye for the hatchery and subsequent planting in the incubation channel. Flooding in early October undoubtedly caused severe losses to naturally spawned eggs but no losses were experienced at the Pitt hatchery despite heavy siltation of the water supply.

The escapement of 45,900 sockeye to Weaver Creek spawning channel included 25,100 females which deposited 104 million eggs, the second largest on record. Female sockeye in the Gates Creek channel suffered above-average prespawning losses; however, egg deposition was 30.1 million, the second largest to date. Sockeye spawners (6,400) at Nadina channel deposited 9.9 million eggs, which was the largest number for an off-cycle year. The improved returns and escapements to Nadina and Gates channels on the non-dominant cycle years comprise a major improvement in the production of these stocks.

The total egg deposition in the four sockeye channels is estimated at 148 million, the second largest total on record.

RESEARCH

J. Babcock, Commissioner of Fisheries for British Columbia, stated in his 1913 report "— the run of sockeye to Adams Lake in August and September of 1901, 1905 and 1909 was so great that every tributary of the lake extending to Tumtum Lake, at the head of the watershed was crowded with spawning sockeye. I visited the headwaters in 1905 and 1909, and saw countless thousands of dead and spawning fish there". Thus it is known that the Adams Lake system had a previous history of producing a large sockeye run.

Attempts to re-establish a sockeye run to the Upper Adams River began in 1949. No sockeye had been reported in the river after 1917 until 1954, when a few fish were observed. During the period from 1949 through the 1970's, 10 eyed-egg transplants of about 10,000,000 eggs and 171,000 fingerlings (mainly of Seymour River stock) were used in an attempt to establish a self-sustaining population.

In 1954, the first sockeye since 1917 appeared in the river and a total of 194 were estimated spawning. On another cycle year, 1964, 162 sockeye were observed. By 1980 this cycle year (1964) escapement had increased to 560 sockeye.

Concurrent with the return of those few sockeye to the Upper Adams River, a sockeye population in nearby Momich River-Cayenne Creek was first observed in 1960. This stock increased from 823 spawners in 1964 to 3,345 fish in 1980. One can only speculate as to the origin of the Momich population as no proof is available that this population is the result of the earlier transplants to the Upper Adams River.

The substantial run in 1980 to the Momich River area provided a suitable donor stock for further rehabilitation efforts since this stock was in close proximity to the Upper Adams River. In 1980, eggs were taken from Cayenne Creek females, reared to the fry stage at Sweltzer Creek field station at Cultus Lake and were then transported to a floating-pen rearing site in Adams Lake near the mouth of Upper Adams River. It was believed that these fry would home to Upper Adams River as adults and that the genetic make-up of the fry would provide a better stock composition than by transplanting additional Seymour stock.

The return of enough sockeye to the Upper Adams spawning grounds in 1984 provided an opportunity to utilize Upper Adams males to fertilize eggs from Cayenne Creek females. Approximately 1,071,000 eggs were taken from Cayenne Creek females. The eggs were transported to the Upper Adams incubation site and fertilized with milt from Upper Adams males. In addition, 40 Upper Adams females were captured and eggs from those fish were fertilized with Upper Adams males giving 121,000 pure Upper Adams eggs. All the eggs were incubated to the eyed stage in Heath trays until mid-October.

The eggs were then divided into three groups. The first group of 448,000 eggs, which included 48,000 pure Upper Adams eggs, was planted in a prepared gravel bed below the natural spawning grounds. A large excavation was made and was filled with washed rock ranging from 1.9 to 7.6 cm in diameter. Screened baskets containing 14.2 litres of gravel and 100 eyed eggs were planted at the top and bottom of the prepared bed so that survival and development could be monitored. Two baskets were recovered at the end of November; the contents indicated that hatching to alevin was complete and survival was 98%.

The second group, which included 372,000 Upper Adams/Cayenne eggs and 44,000 pure Upper Adams eggs, was planted in an incubation box with gravel and an upwelling current of water on the river bank alongside the prepared gravel bed. This box was compartmentalized so that fry from the crossed and pure egg stocks can be recovered separately. Fry recovered from this box will be used for a short-term rearing project in the spring of 1985. Up to 350,000 fry fed for 4-6 weeks in the floating pens will be released to Adams Lake in the spring of 1985.

The third group of approximately 50,000 eyed eggs was transported to rearing facilities at Cultus Lake for a short-term rearing experiment to evaluate food quality and growth, using typical fry densities. The development of these eggs was advanced using the warmer water from Cultus Lake. Feeding of emerged fry began in mid-December and will continue to mid-April, 1985 at Cultus Lake. Fry survival was excellent and growth has been good, considering a consistent 3.9°C water temperature. These fry will be returned to the Upper Adams and will be held in floating pens there for 10-14 days prior to release into Adams Lake.

This program should increase total production of Upper Adams fry by 50%. With normal smolt and marine survival rates and protection from harvesting during their return, another significant gain in the Upper Adams spawning population should be achieved in 1988.

Shuswap Lake was surveyed with hydro-acoustic gear twice during the lake-rearing season for juvenile sockeye salmon of the sub-dominant Adams River population. The data collected during the July 24-28 and November 9-12 surveys indicate that the fingerlings were typically dispersed from 10-30 meters in moderate densities in July, and by early November the depth range had expanded to include the upper 50 meters.

The cooperative program with Biosonics, Inc. to evaluate the combined echo integration/dual-beam techniques to enumerate fingerlings in lakes was continued in 1984. A survey of Cultus Lake in February indicated a measured target strength of -49.8 dB which corresponds to a fish length of 7.4 cm. The trawl catch indicated a mean length of 7.2 cm for the fish captured (Figure 6).

The total Cultus population of 2.38 million (.142 million S.D.) was scaled and adjusted for species composition to yield a juvenile sockeye population estimate of 2.18 million (.131 million S.D.). This estimate compares favorably to the out-migration count of 1.6 million when considering: the possibility of predation during out-migration; the inclusion of larger fish in the acoustic population estimate which were not captured in the

trawl; and the time span between the acoustic survey and the out-migration. These factors suggest that the dual-beam system provides reliable estimates with a substantially reduced data processing time. A report detailing this project will be completed in 1985.

Analysis of data collected in 1983 on the Fraser and Thompson River pink salmon stocks continued in 1984. This program was described in the 1983 Annual Report. An interim report was submitted in early 1984 and a final report will be completed in 1985.

Sea surface temperatures in the north-central Gulf of Alaska were warmer than average early in 1984 and indicated that the timing of the return of the Chilko sockeye stock in 1984 would be very late. The preseason prediction was for the peak of the Chilko run to arrive at Salmon Banks on August 9 to 11, one of the latest dates for this stock on record. The peak at Salmon Banks occurred on August 7-8, 1 or 2 days earlier than predicted.

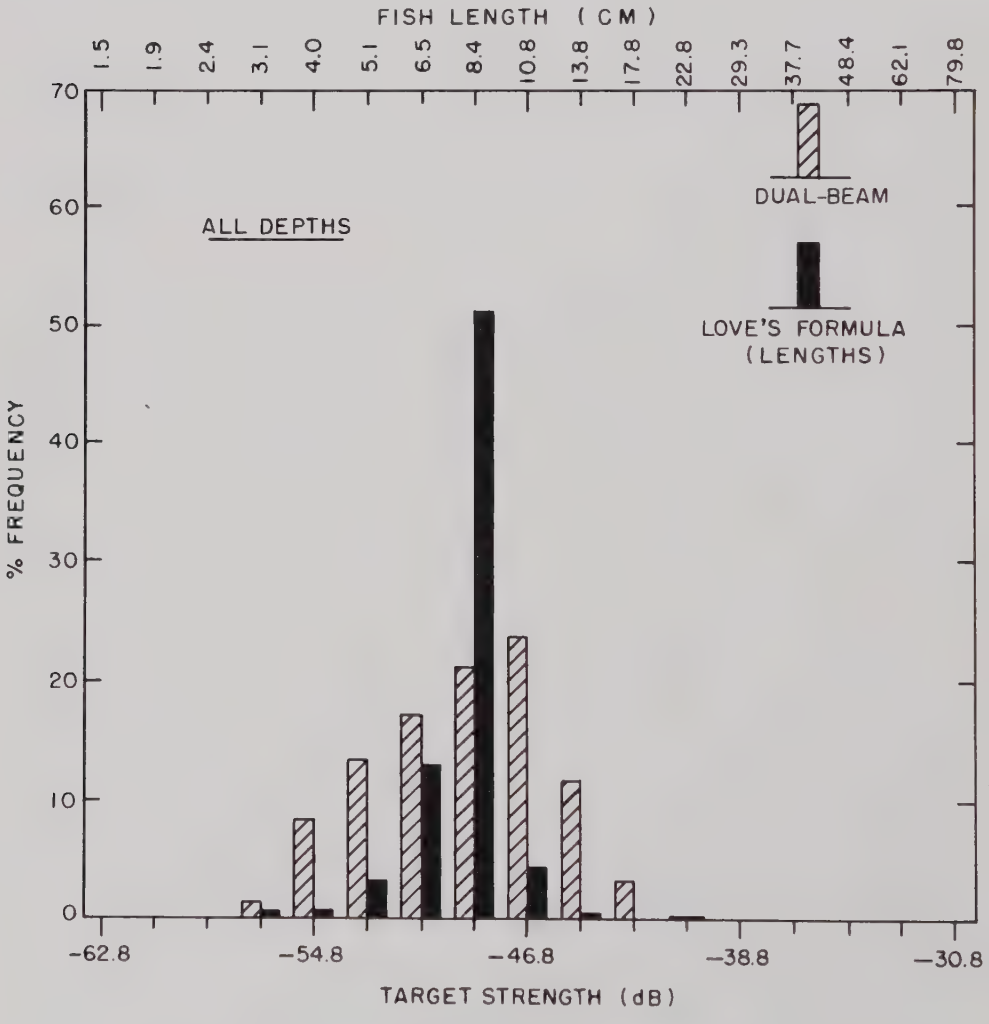

FIGURE 6. Comparison of dual-beam and fish-length estimates of target strength. Fish length converted to target strength according to Love (1977).

Sea surface temperatures (SST) in coastal areas in the spring have shown a positive relationship with the rates of diversion of Fraser sockeye via Johnstone Strait during the years 1978 to 1983. In 1984 these temperatures predicted that diversion would be near 60%. Coastal SST data from April, May and June, which have not been related as positively to diversion rates as SST data in March, showed a lower-than-average warming trend in 1984. This trend may have elicited the lower diversion rate. Indices of the northward transport of coastal surface water in winter and early spring have been useful indicators of diversion rates in recent years. These indicators also predicted a diversion rate of more than 50% in 1984. The air pressure at sea level in the winter in the northeast Pacific is a third factor that has shown a strong relationship with diversion rates in recent years. This indicator predicted a diversion rate of 43% for 1984. Other environmental factors have shown a weaker relationship than those mentioned above; seawater salinities in spring predicted a very high diversion rate and winter sea levels a very low rate of diversion.

The preseason prediction was for a diversion rate from 40 to 70%. The actual sockeye diversion rate for 1984 was 31%. This is above the average of 24% for the years 1953 to 1983, but below the average of 54% for the years 1978 to 1983. Weekly diversion rates were about 11% early in the season, and 40 to 50% towards the end of the season.

It might be argued that if, indeed, environmental conditions that cause sockeye to approach through Johnstone Strait returned to levels in 1984 that were more typical of the period before 1978, then perhaps indicators related to diversion rates from the earlier period but not recent years, should be used in making future predictions. One of these factors is the SST in July for a large area of the Gulf of Alaska between Stn. 'P' and the coast. Another such factor is the flow of the Fraser River at Hope from March to May. The 1984 data for these two factors would have predicted diversion rates of 15% and 10%, respectively, by the standards of the data from 1953 to 1977, i.e. less than half as large as the actual 1984 rate observed. Therefore, it is not clear that the response of the Fraser sockeye to these factors has returned to any pattern 'typical' of the years before 1978.

ENVIRONMENT CONSERVATION

To determine conditions required to obtain consistent detoxification of effluent at Quesnel River Pulp Company, a treatability study was conducted between September 1983 and November 1984 to investigate how the effluent should be treated. The study was conducted under guidance of a committee composed of representatives from the Commission, Environmental Protection Service, Waste Management Branch, Quesnel River Pulp Company and its consultant. Two pilot plants were operated by mill personnel to treat effluents under controlled conditions. Samples of effluents were forwarded to the Commission laboratory for bioassays to evaluate detoxification. Owing to alternation between production of thermomechanical and chemical thermomechanical pulps, raw effluents varied in flow, BOD and acute toxicity. Over the course of the study, influences of dissolved oxygen, pH, nutrient addition and treatment duration were evaluated, using detoxification to a 96 hr LC50 of 100% as the criterion. The study demonstrated that wood extractives, primarily resin and fatty acids, were the principle causes of acute toxicity of raw effluents and could be detoxified by biological treatment. It became evident during the study that the aeration rate specified by B.C. Guidelines for bioassays was insufficient to differentiate between mortalities caused by inadequate oxygen and those caused by the integrated action of chemical toxicants. A detailed report of the study will be prepared by the Treatability Committee.

Treatability studies were also conducted at Belkin Paperboard by a consultant to determine requirements for detoxification of effluent. It was determined that effluent from a pilot plant would meet detoxification criteria after five days treatment. However, there were indications in the study that detoxification may be attainable using shorter treatment times and these have been the subject of further testing.

Cariboo Pulp and Paper Co. received an amended discharge permit from the B.C. Waste Management Branch to allow treatment of up to ten percent municipal sewage in the company's aeration lagoons. This arrangement was made to avoid overload of the municipal sewage treatment plant. The permit also specified modifications and improvements to the mill effluent pH neutralization system and the removal of accumulated solids from the first stage lagoon. Treated effluent is required to meet a 96 hr LC50 of 100%. In monitoring tests in 1984, treated effluent was non-lethal to test fish in 11 of 12 bioassays, which was a significant improvement from the previous year. The company is also required to continue monitoring receiving waters to determine; (1) the zone of influence of the effluent, (2) the receiving water quality and (3) the effects of effluent discharge on the receiving water biological community.

Scott Paper Co. on the Fraser River North Arm constructed a second papermill and comparable treatment capacity in 1983 and commenced operation in early 1984. Effluent was non-lethal in 13 of 14 bioassays in 1984.

Under terms of their discharge permits the three pulp mills near Prince George have sponsored water quality and benthic invertebrate studies since 1963 to monitor the Fraser River. The data were summarized by the companies' consultants and showed an overall improvement in effluent discharged to the Fraser River. Specifically, suspended solids and BOD loads were reduced to about half the amount discharged to the Fraser about ten years ago, while the color load increased. The detoxification record for effluents improved considerably. Furthermore, detoxification improved to a point where the likelihood of sublethal stress conditions occurring even under extreme 7-day low winter flows was considered remote. There was evidence benthic invertebrate populations were increasing owing to organic enrichment but equilibrium had not been achieved.

A representative of Environmental Protection Service requested the Commission to evaluate the potential of a proprietary wastewater treatment additive for detoxification of pulp mill effluents. The product, manufactured in Korea, was reported to contain selected strains of bacteria capable of enhancing wastewater treatment. The product was tested in the Commission's laboratory according to the manufacturer's schedule, but treatment, including detoxification, was not enhanced.

Under terms of a conditional discharge permit, environmental, oceanographic, sediment and engineering studies were conducted by consultants in 1983 to evaluate a proposed deep sewage outfall off Sturgeon Bank at depths of 60 m or more. The report was distributed to concerned agencies in late 1983 for review. The proposal would relocate the present discharge of primary treated sewage (removal of settleable solids) originating at Iona Island sewage treatment plant from Sturgeon Bank to deep water in Georgia Strait. The study concluded that initial dilution of the rising plume of sewage would be about 150:1 and the plume would not rise to within 20 m to 75 m of the water surface. Dilution would increase to 250:1 in about 3.5 hours and to 4500:1 after 15 hours as the plume was dispersed and transported north or south by tidal currents. Owing to dilution and trapping depth, the report concluded that there would be a negligible impact on adult and juvenile salmon.

The Greater Vancouver Sewerage and Drainage District made application to the B.C. Waste Management Branch at the end of 1984 for a deep-water outfall. The Commission will comment officially on the application to the Canada Department of

Fisheries and Oceans. In expectation of the deep water sewage outfall being approved by regulatory agencies, an ad hoc committee was formed to develop pre- and post discharge monitoring programs. The committee was composed of representatives from Greater Vancouver Sewerage and Drainage District, B.C. Waste Management Branch, Environmental Protection Service, Department of Fisheries and Oceans and the Commission. The proposed program would assess effects of the proposed discharge on the environment and fishery resources of the area. Emphasis was placed on detecting subtle changes in environmental health of the area with selected species of biota, including salmon, being examined for bioaccumulation and its effects.

A ski resort is located in Hemlock Valley at the headwaters of Sakwi Creek which supplies water part of the time to Weaver Creek spawning channel. Sewage discharged at the resort is treated in aerated lagoons and then pumped out of Hemlock Valley to the headwaters of Maisal Creek, a tributary of Chehalis River. In January, the pipeline to Maisal Creek became frozen so the treated sewage was discharged to Sakwi Creek without warning or prior arrangement. Sakwi Creek water was not being used in the spawning channel at the time. The discharge was reported to Waste Management Branch which issued a stop order. The discharge was halted, the pipeline thawed and operations returned to normal.

The City of Merritt commissioned a ground disposal system for treated sewage. During low water flow in the Coldwater River, approximately from August 16 to April 14, treated effluent will be discharged to the ground via infiltration basins. When river flows are high, from approximately April 15 to August 15, treated effluent will be discharged to the Coldwater River. Effluent treatment includes the activated sludge process with phosphorous reduction capabilities. To protect aquatic life, dechlorination is specified for effluents discharged to the Coldwater River.

Leachates issuing from landfills of municipal or industrial refuse are often toxic to aquatic life but are amenable to treatment and detoxification. After several years of discharge without treatment, effluent from the Richmond landfill operated by the Fraser River Harbor Commission is being treated. The process includes a storage basin, aerated and facultative lagoons and two-stage sand filters. The discharge permit specifies that effluent be detoxified to meet a 96 hr LC50 of 100%.

Municipal sewage treatment at Fort St. James at the south end of Stuart Lake is being upgraded. When completed, treatment will consist of two anaerobic lagoons followed by an aerated lagoon and a facultative final lagoon. For disinfection purposes, chlorine will be applied to effluent from the aerated lagoon. Dechlorination will occur during storage in the final lagoon. If disinfection is below standards using these methods, chlorination followed by chemical dechlorination will be applied to the final lagoon effluent.

Plans by the City of Kamloops to include land disposal as part of a sewage disposal plan were delayed for financial reasons. An infiltration system for land disposal was constructed but the sewer line required to deliver treated sewage to the infiltration system will not be completed until autumn, 1985. When operational, the land disposal system will be used to minimize the amount of treated sewage discharged to the Thompson River, especially during December through March when the river is most sensitive to enrichment.

Upon recommendation of the Environmental Protection Service, the City of Lillooet extended the outfall for treated sewage into deeper water of the Fraser River and improved solids removal by correcting flow patterns in the sedimentation basin. It was also recommended that effluent quality could be upgraded by applying chemical coagulation to the present primary treatment process but this recommendation was not adopted.

For reasons related to maintenance of the sewerage system and relocations to accommodate construction projects, the Greater Vancouver Sewerage and Drainage District received approval to discharge limited amounts of raw sewage to the Fraser River. While being opposed to discharge of raw sewage, the Commission recognized that circumstances occur where controlled discharges are unavoidable. Thus, when there were no alternatives the Commission and the Department of Fisheries and Oceans specified certain restrictions concerning seasonal timing and tidal stage during discharges to safeguard juvenile and adult salmon.

Carolin Mines is located on Ladner Creek, a tributary of the Coquihalla River. In 1982, this gold mining operation made an unauthorized discharge of cyanide contaminated supernatant from the tailings pond. As reported in the 1982 Annual Report, a survey of pink salmon spawning grounds in lower Coquihalla River indicated no dead or distressed fish and fry appeared normal following the discharge. In 1984, Carolin Mines was fined $135,000 following conviction on 9 of 14 charges arising out of the unauthorized discharge. Treatment procedures were upgraded to improve effluent quality and effluent was monitored by regulatory agencies. At the end of 1984, mining and milling activities had ceased. No date had been set for resuming operations.

Eaglet Mines Ltd. proposed to operate a fluorspar mine on the east shore of the North Arm of Quesnel Lake near Wasko Bay. Fluorspar has a low solubility in water and is of low toxicity to fish. The company proposed to transport fluorspar in large trucks on barges from Wasko Bay to an off-loading point on the south shore of Quesnel Lake. Representatives from Environmental Protection Service, Department of Fisheries and Oceans, the Commission and the company's consultant agreed on environmental documentation studies to be conducted in 1984.

Rhyolite Mines was exploring the potential for gold mining on the west shore of Harrison Lake. Consultants conducted environmental background studies in spring 1984 but subsequent plans for mine development were postponed.

Alcan announced that the Kemano Completion project proposed for the Nechako River would be postponed. However, prior to the announcement, environmental study reports produced by the proponent's consultant were released for review. The Commission forwarded detailed comments to the Department of Fisheries and Oceans concerning Baseline Water Quality, Waste Dilution Capacity-Water Quality and Total Gas Saturation. In many cases the environmental assessments were based on insufficient data of suitable sensitivity. Thus, in some cases it was recommended that the proponent conduct sampling programs to obtain data suitable for assessment of potential impacts.

Approximately 18.7 hectares of the littoral area of Cultus Lake was infested with Eurasian water milfoil (*Myriophyllum spicatum*) in 1984. This area equalled approximately 50 percent of the littoral area and was an increase of 0.4 hectares over 1983. The milfoil control program in 1984 consisted of rotovation of 3.77 hectares to uproot established plants during the summer growing season and application of a special polyester fabric to 0.07 hectares to inhibit growth. Selected areas of Lindell Beach were rotovated but not the main sockeye spawning grounds. The spawning grounds were rotovated in 1983 and a survey in autumn 1984 indicated substantial regrowth but sockeye spawning was not affected. The 1985 treatment program calls for rotovation of the spawning grounds in summer.

In the Salmon Arm area of Shuswap Lake, Eurasian water milfoil showed vigorous growth in spite of high early summer water levels, cold weather when water levels were at a minimum and turbid water during the growing season. The area infested expanded to 28 hectares from 13 hectares in 1983. This expansion occurred in spite of treating 20

hectares by rotovation and diver dredging. It appeared that limiting the spread of Eurasian water milfoil in Shuswap Lake will require a larger control program.

For natural reasons the Fraser River is highly turbid with suspended sediments for most of the year. Sockeye smolts and pink fry migrate seaward in the Fraser River in spring at the same time as the occurrence of peak values of suspended sediment. Adult sockeye generally encounter lesser amounts of suspended sediment, since concentrations decline as summer progresses, but the Early Stuart adults generally encounter the highest turbidities. Some Commission data suggest a relationship between loss of Early Stuart sockeye and turbidity in the Fraser River but the relationship is inconclusive. There are no indications that sockeye smolts or pink fry are adversely affected by suspended sediments, but the amount they can tolerate is unknown.

Owing to the foregoing situation, studies have been conducted at the laboratory to examine pathological effects of suspended sediments on juvenile and adult sockeye. For testing, sediments were collected from sand bars in the Fraser River and graded into four categories, based on particle size. Juvenile sockeye were exposed to a series of concentrations of each size component. The results indicated coarse sediments (200-991 microns) were lethal at about 1700 mg/l whereas fine sediments (74 microns and less) were lethal at about 17,000 mg/l. Gill tissues of juvenile sockeye exposed to 3000 mg/l ''fine'' sediments for four days exhibited some swelling, separation of epithelium from pillar cells and necrosis, but no mortalities occurred at this concentration.

Examination of suspended sediments collected from the Fraser River during upstream migration of Early Stuart sockeye indicated the particle size distribution was similar to that of the ''fine'' type sediment to which juvenile sockeye were exposed in the laboratory. Based on this analysis, adult Early Stuart sockeye were collected at Hell's Gate in early July 1984 and transported to the laboratory for exposure to ''fine'' sediments.

Sockeye were exposed to 1500 mg/l of ''fine'' sediment for nine days. This amount of sediment was similar to the highest values measured in the Fraser River during summer sockeye migrations. In autumn, male Cultus Lake sockeye were exposed to about 500 mg/l ''fine'' sediment for 15 days. In both tests, blood glucose, a stress indicator, was elevated in experimental fish when compared to controls. Results of the foregoing tests will be reported subsequently. Further tests of the effects of suspended sediments will be conducted in 1985.

Water sampling continued in the Nadina, Tachie and Middle River basins to monitor the role of logging and road building in creating suspended sediments (non-filtrable residue) and turbidities in the streams. A total of 336 samples from these areas were tested in 1984. Non-filtrable residue and turbidity were affected little by wet weather indicating the watersheds were generally stable. A few possible trouble spots were identified so these can be monitored more closely. Water samples in the Tachie and Middle River basins were collected by Department of Fisheries officers and were forwarded to the Commission laboratory for analysis.

The Commission continued a joint program with the Department of Fisheries and Oceans to document the sensitivity of salmon-producing waters to acidic precipitation. In 1984, sampling concentrated on selected streams in the Lower Mainland, including Upper Pitt River, where many waters are sensitive to acid and where acidic deposits are greatest. The results of the joint studies, conducted since 1981, were presented at the Third Annual Conference of the Northwest Association for Environmental Studies and will be published jointly with Department of Fisheries and Oceans. Monitoring of selected streams was planned for 1985.

ENGINEERING

A major flood from heavy rainfall and snow melt occurred on January 2 and 3 in the tributaries north of the Fraser River downstream from Hope. The auxiliary water supply intake for the Weaver Creek spawning channel, was inoperative because of severe bank erosion and instream gravel deposition in Sakwi Creek. Gravel deposition in Sakwi Creek and Weaver Creek downstream from Sakwi Creek rose to bank levels, resulting in breakthroughs of the dykes and flooding of adjacent bench land. A dyke breakthrough on Sakwi Creek threatened the main water supply intake on Weaver Creek before the flood receded. Salmon eggs in the natural spawning beds in Sakwi Creek and Weaver Creek below Sakwi have been considered nearly a 100% loss. Fortunately, the sockeye, pink and chum salmon eggs incubating in the Weaver Creek spawning channel were not directly affected by the flood.

Emergency actions in March provided safe downstream passage routes through the accumulated gravel and debris for salmon fry migrating from the Weaver spawning channel. This work involved excavating a stream channel in Weaver Creek from the lower end of the Weaver spawning channel down to Morris Slough. Without this emergency work an estimated 29,300,000 sockeye fry, 1,170,000 pink salmon fry, and 4,400,000 chum salmon fry trying to migrate from the channel into Harrison River would have been lost.

A second phase of emergency work in the Sakwi/Weaver system was completed by the end of September and included extensive removal of gravel deposits, replacement of washed out riprap and dykes and removal of gravel and debris from stream control and water intake structures for the Weaver Creek spawning channel. Completion of this work made it possible for 45,859 adult sockeye and 4,510 chum salmon to migrate up from Morris Slough to spawn in the Weaver Creek spawning channel.

Both phases of the emergency work in Sakwi and Weaver Creeks were planned and supervised by Commission engineering staff. However, this work would not have been possible without the funding of $80,000 provided by the Provincial (flood) Emergency Program and arranged through the B.C. Water Management Branch in Victoria.

The January flood resulted in major gravel shifts in Corbold (7-Mile) Creek adjacent to the Pitt River incubation station, rendering the auxiliary deep well (pumped) water supply system inoperative. The pump unit was removed for repair and later reinstalled. This unit, however, now operates at reduced capacity since adjacent gravel deposits restrict inflow to the pump. In addition to general maintenance at the Pitt River incubation station, including cleaning the gravel in the incubation beds, the aeration tower was rebuilt and a new A.C. diesel electric generator installed as an auxiliary to the present D.C. system.

Tests indicated that the gravel in Gates and Weaver Creek channels required cleaning. However, only the Gates Creek channel was cleaned prior to the spawning of sockeye salmon in 1984.

In conjunction with the rehabilitation program for Upper Adams River sockeye, an upwelling-type incubation box for 500,000 eyed eggs was constructed and placed on the bank of Upper Adams River. The box and water system were designed to withstand the severe subfreezing conditions during the winter incubation period.

For instream incubation of another 500,000 eyed eggs, an area about 27 x 7 m within the Upper Adams River proper was excavated and replaced with cleaned and screened 1.9-7.6 cm size gravel about 41 cm deep. The biological aspects of this project are described in the Research Section.

Routine maintenance was carried out at all spawning channel sites and at the Hell's Gate and Yale fishways. Wooden approach trestles for the Hell's Gate suspension bridge are in an advanced state of decomposition and in need of replacement. Only one small section was repaired in 1984 since adequate funding was not available.

An electric-powered time-actuated raceway sampler was designed and installed for the first time at the Sweltzer Creek fence for enumeration of sockeye smolts migrating from Cultus Lake. This mechanical sampler, (as compared with the fry samplers at spawning channels which measure output based on sampling fry in 5% of water volume) was adjusted to sample the number of smolts migrating downstream every 10 seconds out of 3.3 minutes, about 5% of the time. More than 1.6 million sockeye smolts migrating from Cultus Lake were enumerated by this method.

Industrial development continues at a rapid pace within the Fraser River basin and the problems thus created that affect fisheries require considerable attention. Numerous activities, such as dredging and gravel removal, foreshore developments, bridge and pipeline crossings and logging were referred to Commission staff, investigated and documented to avoid or minimize possible adverse effects on the sockeye and pink salmon resources.

Foremost of other major projects was the Kemano Completion Proposal. A series of public meetings initiated by the Department of Fisheries and Oceans was conducted in the spring at various B.C. locations. Commission staff participated as panel members to provide technical information for general public discussions regarding the power proposal. The Commission's 1983 report entitled "Potential Effects of the Kemano Completion Project on Fraser River Sockeye and Pink Salmon" was discussed at these meetings. In late October, Alcan announced that they had requested the B. C. Utilities Commission to withdraw their application for expansion of power production facilities and increased water use. Additional statements from Alcan indicated postponement of the Kemano Completion Proposal until there is an improvement in the world aluminum market. In cooperation with the Department of Fisheries and Oceans, the ongoing studies carried out by the Commission in respect to the Kemano Completion Proposal have been curtailed.

In 1984, for the fifth consecutive year since 1980, Alcan complied with the Order of the B.C. Supreme Court to spill water from the Nechako reservoir to protect migrating sockeye salmon in the Nechako River from too high water temperatures. Requests to Alcan for flow releases were issued on a daily basis by Department of Fisheries and Oceans during the summer months. Commission staff advised DFO daily about the flow volumes needed for maintenance of adequate water temperatures for protection of sockeye. The advice to DFO was based on predicted water temperatures calculated from expected weather parameters and actual conditions in the Nechako region. This work was done in cooperation with Alcan and its consultants.

The Commission installed and operated temperature monitoring equipment to record water and air temperatures at key locations in the Nechako, Nautley and Stuart Rivers and in the Fraser River and its major tributaries between Prince George and Hope.

Commission staff continued to participate in 1984 in ongoing work to mitigate the impact of constructing another track for the CN Railway adjacent to the Fraser and Thompson Rivers. This included field surveys and participation on an inter-agency Task Force and a Technical Working Group. The Technical Working Group, comprised of personnel from government agencies, CN and consultants cooperated in development of design criteria intended to minimize adverse effects on the fishery resource.

The Commission staff also collaborated with DFO in providing information and commentary for a federally commissioned study entitled "long term environmental

implications to the Fraser and Thompson River corridor due to transportation related activities''.

The construction of the ALRT rapid transportation system and Annacis bridges over the lower Fraser River near New Westminster required detailed attention. The Commission collaborated with Ministry of Highways and DFO personnel in designing studies to assess the impact of the Annacis Crossing upon migrating adult sockeye and pink salmon. Commission staff carried out acoustic studies of fish distribution at the site and provided technical input and guidance to consultants performing associated radio telemetry studies.

Staff took part in an inter-agency committee to coordinate fish-cultural activities at the Alouette Regional Correctional Centre on the Alouette River. Engineering staff supervised the incubation and release into the Alouette River of approximately 750,000 pink salmon fry in the spring of 1984. These fry were the product of a 1983 egg-take from Harrison River pinks. It is hoped that this program will contribute to a re-establishment of the Alouette River pink salmon population which disappeared following damming of the Alouette River and degradation of the river from urbanization.

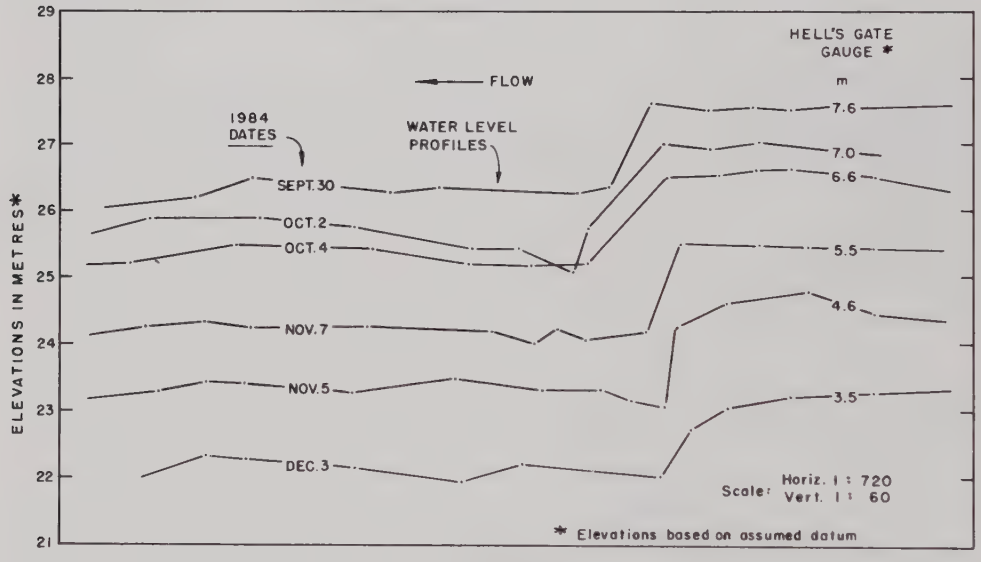

FIGURE 7. Water surface profiles of the Right (west) Bank of the Fraser River at Saddle Rock.

Adult sockeye and pink salmon migrating upstream through the Fraser River canyon between Yale and Lytton are frequently observed during the escapement period each year with specific emphasis at known obstruction points. A migration-delaying obstruction was identified in late September and early October 1981 on the right (west) bank of Fraser River at Saddle Rock when the Hell's Gate gauge was at 4.6 m. This location is about 5.6 km upstream from Yale. A large number of pink salmon were observed to have accumulated below the obstruction. This obstruction was again evident in the fall of 1982, 1983 and 1984 and sockeye salmon (1982), as well as coho salmon (1984), were blocked or delayed at river stages between gauges 4.6 and 7.6 m at Hell's Gate. To assess measures to overcome the apparent obstruction prior to the 1985 salmon runs, a survey was made in

the fall of 1984. The survey included water level profiles and riverbed and riverbank topography. Figure 7 shows local profiles at the obstruction site for the range in Hell's Gate gauge 3.5-7.6 m. The main block occurs just below the greatest gradient. Preliminary analysis indicates that the obstruction could likely be eliminated or greatly reduced by removing a rock pinnacle at that location (Figure 8).

Since any work to correct the problem prior to the 1985 run must be done during winter low water, it was recommended that the rock pinnacle be removed by blasting during low water levels before March, 1985.

FIGURE 8. Fish obstruction point on the Right (west) Bank of Fraser River at Saddle Rock — Photo taken September 30, 1981 at Hell's Gate gauge 5.5 m.

TABLE I

SOCKEYE CATCH BY GEAR

Gear		1972	1976	1980	1984
United States Convention Waters					
Purse Seines	Units	117	193	157	94
	Catch	533,179	669,322	189,899	675,299
	Percent	47.26	50.63	40.74	41.17
Gill Nets	Units	565	789	744	731
	Catch	506,406	628,411	263,138	934,421
	Percent	44.88	47.53	56.45	56.96
Reef Nets	Units	46	45	46	23
	Catch	88,304	23,869	13,050	30,611
	Percent	7.83	1.81	2.80	1.87
Troll	Catch	303	436	86	36
	Percent	0.03	0.03	0.01	0.00
TOTAL CATCH		1,128,192	1,322,038	466,173	1,640,367
Canadian Convention Waters					
Purse Seines	Units	47	101	39	110
	Catch	281,532	605,101	69,853	423,623
	Percent	26.04	43.77	15.31	26.88
Gill Nets	Units	1,004	722	591	736
	Catch	784,405	741,049	379,367	1,038,316
	Percent	72.55	53.60	83.17	65.89
Troll	Catch	15,280	36,334	6,938	113,910
	Percent	1.41	2.63	1.52	7.23
TOTAL CATCH		1,081,217	1,382,484	456,158	1,575,849

NOTE: Gear counts represent the maximum number of units delivering sockeye on a single day near the peak of the run.

TABLE II

CYCLIC LANDINGS OF SOCKEYE FROM CONVENTION WATERS

	United States	*Canada*	*Total*
1984			
Total Landings (No. Sockeye).....	1,640,367	1,575,849	3,216,216
Share in Fish	51.00%	49.00%	
1946-1984			
Total Landings (No. Sockeye).....	63,682,556	62,908,988	126,591,544
Share in Fish	50.31%	49.69%	
1980 Cycle Catch			
1984	1,640,367	1,575,849	3,216,216
1980	466,173	456,158	922,331
1976	1,322,038	1,382,484	2,704,522
1972	1,128,192	1,081,217	2,209,409
1968	885,870	920,092	1,805,962
1964	508,087	514,548	1,022,635
1960	1,198,969	1,255,195	2,454,164
1956	906,872	894,836	1,801,708
1952	1,113,475	1,154,383	2,267,858
1948	1,089,091	752,691	1,841,782
1944	435,443	1,003,826	1,439,269
1940	654,091	1,033,000	1,687,091
1936	453,025	2,126,074	2,579,099
1932	853,406	733,735	1,587,141
1928	630,457	311,226	941,683
1924	772,056	442,250	1,214,306
1920	677,690	532,039	1,209,729
1916	909,425	376,891	1,286,316
1912	2,005,869	1,357,425	3,363,294
1908	1,879,268	870,612	2,749,880
1904	1,506,137	892,934	2,399,071

TABLE III

DAILY CATCH OF SOCKEYE, 1972-1976-1980-1984 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1972**	**1976**	**1980**	**1984**	**1972**	**1976**	**1980**	**1984**	**1972**	**1976**	**1980**	**1984**
1					104,974						194	
2					78,450		13,772				2,511	
3					57,077	188,368	12,907				991	123
4					229	107,849	48,224		106		614	
5							7,651		213		85	
6							8,604	221,439	190			
7					96			117,381	52			
8					26,887	312,686		121,579		754	188	
9					264,096	220,219	33,988	44,506		235	481	
10					100,648	112,490	55,003	71,320		407	194	
11					67,670		62,389	194,193			82	
12							34,997	157,793			3	
13							16,088	98,659	53	381		
14					3,632			57,275	6	50	12	
15					28,126			15,637	5	91	92	
16	1						15,302				70	
17	2,861						22,401				32	
18	2,990						38,774		35		20	
19	4,696	92,800					28,291		24			
20		50,093	7,998		2,809		19,145	17,512		96		
21			14,365		23,404		4,678	41,829		21	10	
22			3,929		17,222			37,646		3	40	
23	6,394		6,934	88,832	252			11,631		2	64	
24	58,086			36,295				3,153			90	
25	44,344			25,744				4,441	31		11	
26	53,366	152,359		20,411				5,078	89			
27	50,708	82,055						6,810	879			
28					137				211	1		
29				12,752	65					1	555	
30	7,840			156,851	55						813	
31	116,110			69,441								
Totals	347,396	377,307	33,226	410,326	775,829	941,612	422,214	1,229,882	1,894	2,042	7,152	123
Troll	111	332	29	10	182	98	53	26				
Monthly Totals	347,507	377,639	33,255	410,336	776,011	941,710	422,267	1,229,908	1,894	2,042	7,152	123
June, Oct. & Nov. Totals									2,780	647	3,499	0
Season Totals									1,128,192	1,322,038	466,173	1,640,367

TABLE IV

DAILY CATCH OF SOCKEYE, 1972-1976-1980-1984 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1972**	**1976**	**1980**	**1984**	**1972**	**1976**	**1980**	**1984**	**1972**	**1976**	**1980**	**1984**
1					108,624					26,461	16,249	
2					66,001	114,159				34,117		
3						331,770						
4							53,398		185		5,703	12,109
5									5,783			6,354
6								390,729	35			
7					217,308					51,294		
8					76,235					12,709	5,383	
9					84,294	101,107					3,752	
10						84,325	35,465					8,647
11							132,180	83,443	2,184		8,491	
12					38,626			146,418				
13					153,479			42,400		3,512		
14					15,165			25,653				
15								62,565				
16						32,817		28,280				
17	4,546					18,006					7,164	
18	4,142					54,068			8,694			
19		19,499					26,314	85,401				4,426
20		11,614						64,032		1,806		
21			7,479		49,742			122,645				
22					15,006		30,586	13,854				
23				103,681	3,317	58,676		9,827			6,809	
24	76,873					5,154		32,338				
25	71,895				13,362	23,660	32,551					
26		165,363				17,274	22,364	4,521				7,568
27		124,928					10,783	21,213				
28			21,912		22,240		10,317					
29					1,531							
30				185,018	617	30,411						
31					5,376	486						
Totals	157,456	321,404	29,391	288,699	870,923	871,913	353,958	1,133,319	16,881	129,899	53,551	39,104
Troll	7,005	13,101	3,158	12,185	7,540	20,357	3,055	93,510	627	2,781	30	8,215
Spring Salmon Gill Nets	768	282							1,999	3,557		
Monthly Totals	165,229	334,787	32,549	300,884	878,463	892,270	357,013	1,226,829	19,507	136,237	53,581	47,319
June, Oct. & Nov. Totals									18,018	19,190	13,015	817
Season Totals									1,081,217	1,382,484	456,158	1,575,849

TABLE V

INDIAN CATCH OF SOCKEYE BY DISTRICT AND AREA, 1980 AND 1984

	1980		1984	
District and Area	*Catch*	*No. of Fishermen**	*Catch*	*No. of Fishermen*
HARRISON-BIRKENHEAD				
Birkenhead River and Lillooet Lake	11,850	1**	10,123	1**
TOTALS	11,850	1**	10,123	1**
LOWER FRASER				
Below Hope	53,673	483	93,917	546
TOTALS	53,673	483	93,917	546
MIDDLE FRASER				
Hope to Lytton	49,515		124,282	
Lytton to Churn Creek	32,595	1,530	31,203	1,188
TOTALS	82,110	1,530	155,485	1,188
CHILCOTIN				
Farwell Canyon to Siwash Bridge	16,267		49,550	
Keighley Holes	755	149	7,324	215
TOTALS	17,022	149	56,874	215
UPPER FRASER				
Churn Creek to Quesnel	2,182	198	16,350	275
Shelley	100	26	3,019	53
TOTALS	3,182	224	19,369	328
NECHAKO				
Nautley and Stella Reserves	13,589	97	15,276	1**
TOTALS	13,589	97	15,276	1**
STUART				
Fort St. James-Pinchi Village	2,532	54	2,588	1**
Tachie, Takla & Trembleur Villages	1,325	114	2,698	1**
TOTALS	3,857	168	5,286	2**
THOMPSON				
Main Thompson	1,000	127	—	—
North Thompson	—	—	—	—
South Thompson	—	—	—	—
TOTALS	1,000	127		
GRAND TOTALS	186,283	2,778	356,330	2,277

* Number of permits issued to Indians in district.

** One permit issued for entire Band, the permit is not included in grand total.

The Indian catch statistics detailed above are obtained from Canada Department of Fisheries and Oceans. Their officers control the taking of sockeye by the Indian populations residing throughout the Fraser River watershed.

TABLE VI

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1972, 1976, 1980, 1984

District and Streams	1984 Period of Peak Spawning	Estimated Number of Sockeye				Jacks	Sex Ratio Males 4-5 Yr.	Sex Ratio Females 4-5 Yr.
		1972*	1976*	1980	1984			
LOWER FRASER								
Cultus Lake	Early Nov.	10,660	4,450	1,687	1,147	153	449	545
Upper Pitt River	Sept. 10-14	13,412	36,530	17,135	15,797	0	7,014	8,783
Widgeon Slough	Nov. 6-9	302	1,391	389	266	0	77	189
HARRISON								
Big Silver Creek	Sept. 22-28	2,552	1,642	610	155	0	85	70
Harrison River	Nov. 10-13	1,399	5,130	5,092	1,267	0	577	690
Weaver Creek	Oct. 18-22	15,505	22,867	33,244	14,511	340	7,671	6,500
Weaver Channel	Oct. 15-20, Nov. 1-6	11,043	28,211	41,595	45,859	428	20,333	25,098
LILLOOET								
Birkenhead River	Sept. 21-28	113,097	108,121	90,922	42,849	2,604	15,893	24,352
SETON-ANDERSON								
Gates Creek	Aug. 27-Sept. 1	1,762	2,889	4,354	2,678	32	1,352	1,294
Gates Channel	Aug. 28-Sept. 12	6,807	14,855	21,140	26,394	141	12,064	14,189
Portage Creek	Nov. 12-17	1,460	3,800	1,998	1,768	58	765	945
SOUTH THOMPSON								
Seymour River	Aug. 29-Sept. 3	2,889	8,489	8,390	17,172	0	8,024	9,148
Lower Adams River	Oct. 19-22	4,325	5,013	2,560	4,183	0	1,864	2,319
Little River	Oct. 19-22	81	175	32	49	0	22	27
Scotch Creek	Aug. 24-28	47	41	205	428	19	136	273
Upper Adams River	Aug. 29-Sept. 2	31	40	560	3,502	0	1,636	1,866
Momich-Cayenne Creek	Aug. 22-25	1,003	1,998	3,345	5,854	0	1,997	3,857
NORTH THOMPSON								
Raft River	Aug. 30-Sept. 3	11,151	8,684	5,418	19,098	12	10,209	8,877
Barriere River	Aug. 22-25	94	85	133	86	0	30	56
Fennell Creek	Aug. 22-25	1,931	4,090	8,437	11,021	0	3,907	7,114
North Thompson River	Mid-Sept.	465	500	36	31	0	9	22
CHILCOTIN								
Chilko River	Oct. 4-10	564,465	364,311	468,658	452,968	350	223,925	228,693
Chilko Lake South End	Late Sept.	2,132	23,156	30,168	127,696	135	63,104	64,457
Taseko Lake	Sept. 8-12	2,287	634	679	2,771	0	1,141	1,630
QUESNEL								
Horsefly-McKinley Creek	Sept. 4-15	3,385	2,064	3,162	6,078	5,184	316	578
Mitchell River	Sept. 18-20	85	101	14	63	43	7	13
Little Horsefly River		18	32	0	45	45	0	0
NECHAKO								
Endako River		27	40	25	0	0	0	0
Nadina River (Early)	Sept. 1-2	827	101	205	806	0	452	354
Nadina River (Late)	Sept. 20-25	2,702	279	58	659	0	350	309
Nadina Channel	Sept. 19-24	—	1,394	3,021	6,413	2	3,150	3,261
Nithi River		58	0	54	0	0	0	0
Ormonde Creek		54	30	0	0	0	0	0
Stellako River	Sept. 20-25	36,771	150,741	72,073	60,973	16	27,594	33,363
STUART								
Early Runs								
Forfar Creek	Aug. 1-5	835	1,249	2,328	6,848	0	3,131	3,717
Gluske Creek	Aug. 3-6	591	966	1,049	6,943	15	3,207	3,721
Kynoch Creek	Aug. 1-5	2,534	6,727	10,661	16,933	5	7,820	9,108
Narrows Creek	Aug. 1-5	104	244	257	1,568	0	758	810
Rossette Creek	Aug. 2-5	834	2,090	2,054	8,147	21	3,616	4,510
Takla Streams	Aug. 9-13	143	1,120	428	2,774	5	1,142	1,627
Misc. Streams	July 27-Aug. 1	15	252	249	2,034	0	940	1,094
Early Stuart Totals		(5,086)	(12,648)	(17,026)	(45,247)	(46)	(20,614)	(24,587)
Late Runs								
Kazchek Creek		65	33	0	0	0	0	0
Middle River	Approx. Sept. 21	972	330	198	184	0	83	101
Tachie River	Approx. Sept. 21	7,527	2,637	756	810	0	367	443
Late Stuart Totals		(8,704)	(3,000)	(979)	(1,228)	(0)	(556)	(672)
NORTHEAST								
Upper Bowron River	Aug. 24-28	4,138	2,250	2,894	10,461	0	5,091	5,370
TOTALS**		830,128	823,453	848,320	931,671	9,612	441,503	480,556

* Numbers for some populations have been revised from the respective Annual Reports.

** Totals include small numbers of fish in small tributaries not listed in the table.

TABLE VII

DAILY CATCH OF SOCKEYE, 1969-1973-1977-1981 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1969**	**1973**	**1977**	**1981**	**1969**	**1973**	**1977**	**1981**	**1969**	**1973**	**1977**	**1981**
1	6,906					242,792	14,338			12,031	13	711
2	4,731	110,423							4,142	7,085		5,719
3		80,632			122,566			5,110	3,683	3,912		269
4		75,761			77,758			57,906				
5			230,143	30,318	63,332			38,069			302	
6			98,478	67,273			12,777	42,319			15	
7	1,824		18,638	28,251			145,053	22,340				65
8	1,931		39,389	40,673		249,821	3,031	35,587	18			1,940
9	2,324	153,802					41,953	106,214	78	1,429		114
10		78,082					1,060	120,879	981	484		99
11		77,654		29,248	42,399			114,430	266	126		
12		60,972		31,465	18,044			42,651				30
13		47,992		9,305	15,558			26,427				1,122
14	16,173		119,339		12,433	102,899	2,723	11,207				709
15	9,948					39,202	61,433		191			2
16		85,708					31,546		30		18	30
17		40,820							2	49		172
18		43,260			17,370			41,587		22		65
19					23,237			39,773				
20				39,272		84,981		7,387			22	5
21	221,188			30,055		58,765	776	6,973			1	7
22	156,203			34,124		33,417	17,032		98		4	13
23	182,627	120,363				10,132	7,411		699			11
24		79,529	26,703				5,522		91	6		
25		69,739	386,882		19,605		82	37,029	41	9		
26			16,671		17,334		59	20,380			346	
27				143,894		30,423		1,808			226	
28	230,072					13,494		2,889			120	
29	201,102						92	6,545	1,004			
30	92,332	287,354	15,296				5,446	11,114	294			
31		279,495	241,105				1,414					
Totals	1,127,361	1,691,587	1,192,644	483,878	429,636	865,927	351,748	798,624	11,618	25,153	1,067	11,083
Troll	131	285	377	53	210	108	492	57	1	1	0	0
Monthly Totals	1,127,492	1,691,872	1,193,021	483,931	429,846	866,035	352,240	798,681	11,619	25,154	1,067	11,083
June, Oct. & Nov. Totals									17,219	44,520	243,281	791
Season Totals									1,586,176	2,627,581	1,789,609	1,294,486

TABLE VIII

DAILY CATCH OF SOCKEYE, 1969-1973-1977-1981 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1969**	**1973**	**1977**	**1981**	**1969**	**1973**	**1977**	**1981**	**1969**	**1973**	**1977**	**1981**
1	10,842					140,333	254,774		1,272	2,157	205	
2	10,654	77,811		49,795		108,960	49,889		709	1,489		
3		27,430						150,102		25,190		
4		16,248	216,751		178,581			46,535				
5			97,485		81,629						53	
6		Strike			51,902	264,462	170,652				19,158	1,697
7		July 6-		48,376		50,062	45,446	117,472	286			879
8		July 15				36,412	37,489		163		17,653	3,795
9	5,363	32,772				150,843	49,295		177	97		409
10						61,480	66,984		287	11,213		2,782
11					34,096			103,507		70		
12				35,688	62,362			16,493		37	25,675	
13			68,514		15,882	57,682		15,507				
14	22,096		22,076			138,703					26,723	3,595
15		26,786				105,299	96,228					
16		12,961					11,790					
17		8,966							45	7,972		
18		10,905			8,471			30,058	16	4		
19					4,830			171,135		7		
20			95,756	36,499	13,310	93,807						
21	96,953		31,816			26,584					9,328	
22	30,593					26,578	20,032	58,606				
23		243,444				11,668	2,928		15			
24		150,685					1,142	39,657	35	2,595		
25		112,045	351,221					11,337		22		
26			43,025		5,907			11,356		13,637		
27	368,974			130,992		31,894						
28	229,115					7,784						
29	160,326					11,313	5,771	6,412				
30	91,292	150,434			1,159			6,666	18			
31	79,400	215,403			1,160		369	26,643				
Totals	1,105,608	1,085,890	926,644	301,350	459,289	1,323,864	812,789	811,486	3,023	64,490	98,795	13,157
Troll	43,240	24,079	17,012	2,467	18,802	28,890	13,699	26,051	4,419	3,574	1,715	2,079
Spring Salmon Gill Nets	3,079								8,288	1,769	517	
Monthly Totals	1,151,927	1,109,969	943,656	303,817	478,091	1,352,754	826,488	837,537	15,730	69,833	101,027	15,236
June, Oct. & Nov. Totals									29,788	46,414	99,982	3,063
Season Totals									1,675,536	2,578,970	1,971,153	1,159,653

TABLE IX

SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1969, 1973, 1977, 1981

District and Streams	1981 Period of Peak Spawning	Estimated Number of Sockeye			
		1969	**1973**	**1977**	**1981**
LOWER FRASER					
Cultus Lake	Nov. 15-20	6,739	858	353	1,159
Upper Pitt River	Sept. 10-14	25,084	11,928	13,887	25,327
Widgeon Slough	Oct 29-Nov. 1	715	427	427	572
HARRISON					
Big Silver Creek	Sept. 18-21	85	270	349	173
Harrison River	Nov. 15-17	15,006	3,060	2,246	3,193
Weaver Creek	Oct. 10-16	41,857	27,807	22,105	24,138
Weaver Channel	Oct. 16-22	17,089	22,366	33,040	19,655
LILLOOET					
Birkenhead River	Sept. 23-30	64,527	139,295	43,139	65,495
SETON-ANDERSON					
Gates Creek	Aug. 25-Sept. 4	205	231	1,176	821
Gates Channel	Aug. 30-Sept. 3	676	668	1,713	3,988
Portage Creek	Nov. 1-6	1,040	4,272	7,974	6,086
SOUTH THOMPSON					
Seymour River	Aug. 28-Sept. 2	7,327	2,856	5,911	11,529
Scotch Creek	Aug. 28-31	3,395	6,235	13,586	18,952
Lower Adams River	Oct. 12-15	45,908	33,312	57,964	31,097
Little River	Oct. 15-18	6,842	6,689	8,684	8,169
South Thompson River	Oct. 3-6	630	545	432	182
Lower Shuswap River	Oct. 10-15	1,703	7,452	14,695	7,358
Misc. Streams	—	236	0	0	101
NORTH THOMPSON					
Raft River	Aug. 29-Sept. 2	5,593	2,729	648	873
Barriere River	—	40	22	16	0
Fennell Creek	Aug. 26-29	52	205	355	2,113
North Thompson River	—	—	—	1,372	0
CHILCOTIN					
Chilko River	Sept. 21-27	76,518	61,707	54,322	35,909
QUESNEL					
Horsefly River	Aug. 24-Sept. 7	270,027	253,388	473,008	677,389
Mitchell River	Sept. 14-17	8,939	24,673	42,396	66,106
NECHAKO					
Nadina River (Early)	Sept. 5-10	8,541	2,705	1,453	821
Nadina River (Late)	Sept. 21-25	27,898	7,951	610	1,024
Nadina Channel	Sept. 19-23	—	8,786	16,286	17,892
Nithi River	Late Aug.	140	54	150	100
Stellako River	Sept. 29-Oct. 4	49,341	30,755	23,452	22,021
STUART					
Early Runs					
Ankwill Creek	Aug. 3-7	15,795	21,790	6,287	8,497
Bivouac Creek	Aug. 1-3	952	1,884	952	285
Driftwood River	Aug. 1-10	37,028	131,172	54,568	47,298
Dust Creek	Aug. 3-7	3,595	17,850	16,200	5,044
Felix Creek	Aug. 3-7	5,879	7,465	2,160	6,200
15 Mile Creek	Aug. 1-7	209	1,090	452	815
5 Mile Creek	Aug. 3-6	902	2,408	907	369
Forfar Creek	July 30-Aug. 4	9,922	18,924	3,628	12,228
Forsythe Creek	July 30-Aug. 2	2,248	10,907	3,677	2,386
Frypan Creek	July 30-Aug. 2	3,145	5,799	4,383	1,864
Gluske Creek	Aug. 2-6	4,660	19,450	4,646	10,741
Kynoch Creek	July 30-Aug. 6	12,380	22,485	5,893	13,452
Leo Creek	Aug. 4-7	571	1,390	646	78
Narrows Creek	July 29-Aug. 4	5,746	5,726	2,844	3,583
Paula Creek	Aug. 3-6	794	2,787	918	1,626
Rossette Creek	July 29-Aug. 4	1,566	4,156	2,261	8,018
Sakeniche River	—	691	4,175	288	6
Sandpoint Creek	July 29-Aug. 6	693	3,178	1,519	1,224
Shale Creek	Aug. 1-7	706	3,260	1,672	1,630
25 Mile Creek	July 31-Aug. 7	0	744	164	923
Misc. Streams	Aug. 1-6	2,336	14,013	3,952	3,231
Early Stuart Totals		(109,818)	(300,653)	(118,017)	(129,498)
Late Runs					
Kazchek Creek	Sept. 15-18	178	2,909	720	6,872
Kuzkwa Creek	Sept. 10-15	8,370	20,124	9,031	20,520
Middle River	Sept. 12-16	111,322	91,879	80,420	125,630
Pinchi Creek	Sept. 14-16	756	1,271	1,719	1,494
Tachie River	Sept. 19-24	86,431	97,445	54,282	94,050
Misc. Streams	Sept. 17-21	—	715	457	1,133
Late Stuart Totals		(207,057)	(214,343)	(146,629)	(249,699)
NORTHEAST					
Upper Bowron River	Aug. 28-31	3,872	4,700	2,500	1,170
TOTALS*		1,006,972	1,181,093	1,113,453	1,442,675

* Totals include small numbers of fish in small tributaries not listed in the table.

TABLE X

DAILY CATCH OF PINK SALMON, 1977-1979-1981-1983 FROM UNITED STATES CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1977**	**1979**	**1981**	**1983**	**1977**	**1979**	**1981**	**1983**	**1977**	**1979**	**1981**	**1983**
1					1,040			4,179	17,172		35,858	
2								5,834			461,655	
3							3,229	3,481		306,247	3,835	
4							13,656	3,390	1,641	59,389		
5	220		32			14,791	11,571		152,848			
6	203		110		854	33,009	13,013	1,568	10,868			
7	71		23		8,841	34,056	4,538	3,168			18,918	
8	189		91		109		6,772	7,852			471,496	
9					8,300		18,899	6,118			40,374	80,267
10					644		21,083	1,567			36,505	292,682
11			200				26,709				4,353	136,841
12			666				12,446				24,795	
13			164			42,539	10,487		219		105,752	
14			256		1,796	132,837	11,252				53,736	163,495
15					46,828	113,410					6,130	250,517
16	1,776	4,266			70,333			6,221	5,344	12,762	7,113	45,826
17	409	925						42,926	55	70,785	35,350	48,937
18		1,608					165,098	42,297		3,790	11,586	
19						7,602	177,216		36	1,620	1,462	23,282
20			2,609			476,678	88,850		2,042		337	71,637
21			2,325		23,559	478,797	79,974	6,277	1,623		4,793	
22		5,203	4,100		446,813	95,190		55,275	995		7,447	
23		13,237			246,590	345,863		55,356			3,024	
24	2,163	8,198			275,569	60,371		45,182				
25	4,015			1,200	21,322	28,794	483,314					
26	1,363			2,037	20,728	548,344	498,424	13,005	743			
27			9,255	3,156		457,938	115,077	48,861	780			
28			3,202			35,947	136,034	31,670	243			
29					9,689	347,355	170,459	122,634				
30	422	12,529			360,684	15,619	273,423	138,926				
31	4,657	3,019			250,303	12,722						
Totals	15,488	48,985	23,033	6,393	1,794,002	3,281,862	2,341,524	645,787	194,609	454,593	1,334,519	1,113,484
Troll	40,202	34,918	35,736	1,812	118,162	224,700	139,418	102,416	4,394	2	479	200
Monthly Totals	55,690	83,903	58,769	8,205	1,912,164	3,506,562	2,480,942	748,203	199,003	454,595	1,334,998	1,113,684
June, Oct. & Nov. Totals									1,573	1,213	862	538
Season Totals									2,168,430	4,046,273	3,875,571	1,870,630

TABLE XI

DAILY CATCH OF PINK SALMON, 1977-1979-1981-1983 FROM CANADIAN CONVENTION WATERS

	JULY				AUGUST				SEPTEMBER			
Date	**1977**	**1979**	**1981**	**1983**	**1977**	**1979**	**1981**	**1983**	**1977**	**1979**	**1981**	**1983**
1					12,490				50,134			
2					5,713			273				
3							234					
4	75						5,331			49,036		
5									30,598			
6					1,433	75,235			108,270		248,776	34,692
7					23,843	499	758				150,069	
8					20,702				69,482		121,764	
9		66			24,390						52,801	89,817
10					693						48,062	
11							747					
12						1,547	77,045		28,051			37,414
13	172					119,176	101,425		1,279			32,657
14						155,509			44,759		154,919	28,634
15					207,768							139,676
16		165			116,168	2,887						
17										6,309		98,984
18							93,787			3,678		82,413
19							105,277		548			104,745
20	173		260			317,597			126			69,824
21	152					240,369			9,285			69,633
22					37,831	98,272	4,006	24,485				45,460
23		182			136,178	2,467						
24					55,838		226,658					
25	4,633					623,102	293,375	9,102				
26	120					384,563	237,385					
27			12,232	263		244,486						
28												
29					3,685		384,824	22,435				
30		175				257,934	432,006	28,644				
31					87,617		389,248					
Totals	5,325	588	12,492	263	734,349	2,523,642	2,352,106	84,939	342,522	59,023	776,391	833,949
Troll	274,529	129,511	123,278	501	604,639	1,297,321	667,981	90,484	45,067	35,543	249,699	57,765
Spring Salmon Gill Nets									3,527			
Monthly Totals	279,854	130,499	135,770	764	1,338,988	3,820,963	3,020,087	175,423	391,116	94,566	1,026,090	891,714
June, Oct. & Nov. Totals									65,520	85,327	5,906	1,959
Season Totals									2,075,478	4,131,355	4,187,853	1,069,860

TABLE XII

SUMMARY OF THE PINK SALMON ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS

District and Streams	*1983 Period of Peak Spawning*	*Estimated Number of Pink Salmon*			
		1977	**1979**	**1981**	**1983**
EARLY RUNS					
LOWER FRASER					
Main Fraser	Oct. 7-14	775,016	1,521,856	2,252,368	3,307,834
FRASER CANYON					
Coquihalla River	Oct. 10-15	2,821	16,468	24,029	29,190
Jones Creek	Oct. 11-13	3,350	4,993	4,485	973
Misc. Tributaries	Oct. 1-27	3,687	4,149	14,720	16,293
SETON ANDERSON					
Seton Creek	Oct. 14-20	341,256	549,512	519,393	407,791
Upper Seton Channel	Oct. 14-20	11,122	9,956	10,402	9,691
Lower Seton Channel	Oct. 14-22	37,163	34,494	33,846	31,045
Portage Creek	Oct. 10-17	19,904	51,842	18,733	10,202
Bridge River	Oct. 12-16	25,800	65,759	43,940	41,909
Gates Creek	—	96	1,277	88	0
THOMPSON					
Thompson River and Tributaries	Oct. 7-18	972,941	885,402	1,166,348	512,398
TOTALS*		2,193,156	3,154,945	4,097,269	4,373,049
LATE RUNS					
HARRISON					
Harrison River	Oct. 22-28	126,782	269,858	314,519	146,014
Chehalis River	Oct. 12-15	2,613	2,067	169	452
Weaver Creek	Oct. 20-25	2,397	117	1,006	1,439
Weaver Channel	Oct. 20-25	963	737	1,287	1,887
CHILLIWACK-VEDDER					
Chilliwack-Vedder River	Oct. 14-18	48,561	124,041	68,601	99,240
Sweltzer Creek	Oct. 25-Nov. 4	5,093	8,889	5,213	9,134
TOTALS*		186,409	405,709	391,067	258,572
GRAND TOTALS*		2,387,811	3,560,654	4,488,336	4,631,621

* Totals may include small numbers of fish in small tributaries not listed in the table.

COMMISSION PUBLICATIONS, 1984

Annual Report of the International Pacific Salmon Fisheries Commission for 1983.

STAFF PUBLICATIONS IN OTHER JOURNALS

Escapement estimation in the management of Fraser River sockeye salmon. 1984. J. C. Woodey, p. 121 to 132. *In* P.E.K. Symons and M. Waldichuk (ed.). Proceedings of the workshop on stream indexing for salmon escapement estimation, West Vancouver, B.C., 2-3 February, 1984. Can. Tech. Rep. Fish. Aquat. Sci. No. 1326.

INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

Advisory Committee Members and Period of Service since Inception of the Commission

CANADA

Salmon Processors

Richard Nelson	1938-1966
Ken Fraser	1966-1971
Lloyd Monk	1971-1977
J. O'Connor	1977-1980
Brian Fraser	1980-

Purse Seine Fishermen

M. E. Guest	1938-1939
W. T. Burgess	1941-1945
George Miller	1945-1949
H. Martinick	1949-1950
W. J. Petrie	1950-1956
George T. Brajcich	1956-1957
C. N. Clarke	1957-1967
F. Buble	1967-1972
John Lenic, Jr.	1972-1973
John Brajcich	1973-1984

Gill Net Fishermen

F. Rolley	1938-1944
Homer Stevens	1944-1949
P. Jenewein	1949-1970
Frank Nishii	1970-

Troll Fishermen

W. A. Hawley	1938-1939
A. E. Carr	1944-1952
M. Berg	1952-1955
H. North	1955-1960
R. H. Stanton	1960-1969
M. Guns	1969-1971
	1975-1979
W. Edwards	1971-1973
M. Ellis	1973-1975
John Makowichuk	1979-1983
Brian Fahey	1983-

Purse Seine Crew Members

H. Staveness	1958-1975
Nick Carr	1976-

Sport Fishermen

M. W. Black	1938-1961
J. C. Murray	1961-1965
R. H. Wright	1965-1972
H. English	1972-1980
A. Downs	1980-1984

Native Indians

D. Guerin	1981-1983
S. Douglas	1984-

UNITED STATES

Salmon Processors

C. J. Collins	1938-1949
J. Plancich	1949-1972
D. Franett	1972-1980
J. Lind	1980-1984
J. Theodore	1984-

Purse Seine Fishermen

L. Makovich	1938-1946
N. Mladinich	1946-1976
W. Green	1976-1984
V. Barcott	1984-

Gill Net Fishermen

C. Karlson	1938-1958
J. F. Jurich	1946
J. Erisman	1958-1964
V. Blake	1964-1967
R. Christensen	1967-1982
R. Suggs	1982-

Troll Fishermen

S. Leite	1938-1945
E. Larum	1939-1943
C. J. Dando	1946-1948
A. Anderson	1948-1949
J. R. Brown	1949-1957
B. J. Johnson	1958-1962
F. Bullock	1962-1966
C. Mechals	1966-1972
F. Lowgren	1972-1973
G. D. Simmons	1973-1981
W. Kimzey	1981-1982
C. Finley	1982-1984
M. Davis	1984-

Reef Net Fishermen

J. R. Brown	1958-1974
G. H. Schuler	1974-1978
T. Philpott	1978-

Sport Fishermen

K. McLeod	1938-1953
H. Gray	1953-1972
E. Engman	1972-

Native Indians

C. Peterson	1981-

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John F. Roos, Director

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O. T. Brockwell
J. D. Cave
P. Cheng
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Mrs. G. Grant
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R. B. Kent
Miss K. McCarthy
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K. L. Peters
E. B. Phillips, Administrative Officer (to July)
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L. V. Woods

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K. F. Morton
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E. R. Stewart
G. Suther
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SETON CREEK CHANNELS	M. King
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NADINA RIVER CHANNEL	B. A. Van Horlick